The Fauna of Akkeshi Bay
IX Nemertini[1)]

By

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(*With 4 coloured plates and 33 textfigures*)

1. Introduction

The nemertean fauna of the coasts of Hokkaido has, up to the present time, almost entirely been unknown to us except only one species, *Amphiporus depressus* (Stimpson), which had been collected at Hakodate by Stimpson about a century ago (1857). Recently (1933), two other nemerteans, (*Amphiporus nebulosus* Coe and *Cerebratulus communis* Takakura), were reported by Takakura from the adjacent waters, the northern Kurile Islands. Of the fresh-water nemerteans, one species, *Prostoma graecense* (Böhmig), is known to us (Ishizuka, 1933). In this report are described nemertean examples collected by the author in Akkeshi Bay and on other coasts of Hokkaido. Out of 21 species belonging to 13 genera, 6 species are probably new to science. Before proceeding further, I should like to express my cordial thanks to Prof. Dr. T. Uchida for his kind guidance. Further, I tender my hearty thanks to the authorities of the Mitsui Institute of Marine Biology for the great help given to complete the present paper.

2. List of species treated in the present paper

I. Subclass ANOPLA

1. Order PALAEONEMERTINI

1. Fam. Tubulanidae BÜRGER, 1904

1) Contributions from the Akkeshi Marine Biological Station, No. 32.

Gen. *Tubulanus* RENIER, 1804
1. *Tubulanus punctatus* (TAKAKURA, 1898)
2. *Tubulanus ezoensis* sp. nov.

2. Fam. Cephalotrichidae MCINTOSH, 1874
Gen. *Cephalothrix* OERSTED, 1843
3. *Cephalothrix linearis* (RATHKE, 1799)

2. Order HETERONEMERTINI
1. Fam. Lineidae MCINTOSH, 1874
1. Subfam. Lineinae BÜRGER, 1904
Gen. *Lineus* SOWERBY, 1806
4. *Lineus torquatus* COE, 1901
5. *Lineus alborostratus* TAKAKURA, 1898
2. Subfam. Cerebratulinae FRIEDRICH, 1935
Gen. *Cerebratulus* RENIER, 1804
6. *Cerebratulus marginatus* RENIER, 1804
7. *Micrura alaskensis* COE, 1901
8. *Micrura akkeshiensis* sp. nov.
9. *Micrura magna* sp. nov.
10. *Micrura bella* (STIMPSON, 1857)
11. *Micrura uchidai* sp. nov.
2. Fam. Baseodiscidae BÜRGER, 1904
Gen. *Baseodiscus* DIESING, 1850
12. *Baseodiscus curtus* (HUBRECHT, 1879)

II. Subclass ENOPLA
1. Order HOPLONEMERTINI
Suborder MONOSTILIFERA BRINKMANN, 1917
1. Fam. Emplectonematidae BÜRGER, 1904
Gen. *Emplectonema* STIMPSON, 1857
13. *Emplectonema gracile* (JOHNSTON, 1937)
Gen. *Nemertellina* FRIEDRICH, 1935
14. *Nemertellina minuta* FRIEDRICH, 1935
Gen. *Paranemertes* COE, 1901
15. *Paranemertes peregrina* COE, 1901
2. Fam. Amphiporus MCINTOSH, 1874
Gen. *Amphiporus* EHRENBERG, 1831
16. *Amphiporus parvus* sp. nov.
Gen. *Zygonemertes* MONTGOMERY, 1897
17. *Zygonemertes grandulosa* sp. nov.
3. Fam. Prostomatidae BÜRGER, 1904
Gen. *Prostoma* ANT. DUGÉS, 1828
18. *Prostoma coronatum* (QUATREFAGES, 1846)

19. *Prostoma nigrifrons* (COE, 1904)
20. *Prostoma stigmatum* (STIMPSON, 1857)

2. Order BDELLOMORPHA

Gen. *Malacobdella* BLAINVILLE, 1827
21. *Malacobdella japonica* TAKAKURA, 1897

3. Material and method

The material for the present study was collected mainly by beach collection, but some were obtained by dredging bottoms of the sea or by tow-netting among sea-weeds. The collection was carried out during the period of five months, from April to August of 1938, on the coasts of the following localities, all in Hokkaido: Muroran (1st–4th, April), Akkeshi (April 12th–July 30th), Mokoto, Masuura and Abashiri (12th–14th, July), Ochiishi, Nemuro, Habumai, Goyomai and Nosappu (24th–27th, July), and Muroran, Usu, Suttsu and Yoichi (9th–19th, August).

All the nemerteans thus collected were cultured in dishes containing sea-water, which was refreshed every day. It was possible for the author to keep the worm in life as long as few weeks or even a month, during which time careful observations on their habits and on their structure were made. In order to observe minute external characters and to fix the animals in normally expanded condition, nemerteans were narcotized by adding at first 70% alcohol drop by drop to dishes containing worms in sea-water, then fixed by pouring over them a great quantity of alcohol, and then were preserved in 80% alcohol. The formalin of about 10% was used in place of alcohol and resulted in fairly good preparations. The vital staining by methylen blue was tried for the study of nervous system, but failed to get good preparations. These fixed specimens were sectioned serially, 10–15μ in thickness, by the paraffin method and then stained with Mallory's (original) staining solution or eosin-hæmatoxylin.

4. Description

Subclass I ANOPLA
Order 1 PALAEONEMERTINI
Family 1 Tubulanidae BÜRGER, 1904
Genus *Tubulanus* RENIER, 1804

Tubulanus punctatus (TAKAKURA, 1898)

(Pl. I, figs. 1, 2; Textfigs. 1, 2)

Carinella punctata: TAKAKURA, 1898, Zool. Mag., 10, pp. 117–118, fig. 3.
Tubulanus nothus: WHEELER, 1934, Disc. Rep., pp. 225–228, pl. 15, figs. 1–2, text-figs. 1–4.

External characters. The body is long and slender, 15–35 cm long and 1–4 mm wide, with flattened ventral and convex dorsal surfaces. The head is crescent-shaped, broader than any other parts of the body, and clearly marked off from the rest of the body. The posterior portion of the head becomes wide and again tapers gradually to a blunt end. Specimens with the intact tail-end were hardly met with, because the posterior portions of the body are liable to be cut off autotomically. A pair of inconspicuous whitish yellow cephalic grooves which are found on the sides of neck, are semi-circular in outline and send out short dorsal and ventral branches from the anterior end. The proboscis pore and the mouth are small longitudinal slits on the mid-line of ventral surface of head, the former being situated near the anterior end and the latter just posterior to the caphalic grooves. The body is generally blackish brown, or sometimes chestnut-brown or brownish yellow, and fading gradually to brownish yellow towards the posterior end, the ventral surface being somewhat paler than dorsal. There is near the frontal margin of the head a white ring which is sometimes formed of white dots in a row. Numerous white rings existing throughout the body are arranged at about the same distance apart from each other, broad and narrow rings being alternative except near the posterior end where the arrangement is rather irregular. The first body ring is

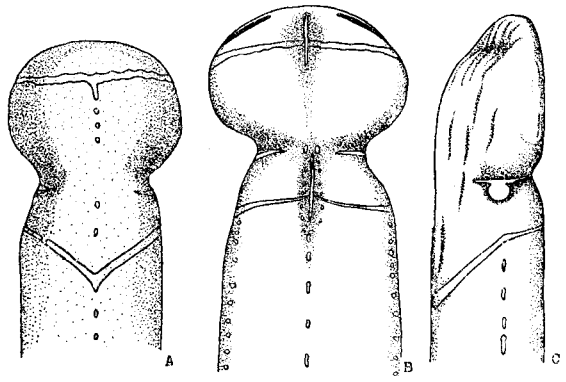


Fig. 1. *Tubulanus punctatus*; anterior portion of body; A. Dorsal view. ×5; B. Ventral view. ×6; C. Side view. ×6.

situated posterior to the head about the same distance apart as the width of the head; it is V-shaped dorsally and traverses the mouth-slit on the ventral surface. The second ring is rather inconspicuous and narrow, and is sometimes formed of dots. The third is broad, being formed of two narrow bands placed closely together. There are white longitudinal dotted lines on the mid-dorsal and both lateral surfaces of the body, though very obscure. The mid-dorsal line begins from head ring or from neck, while the lateral lines from the first body ring, but all of these reach the posterior end of the body. They cross the body ring at right angles making clear white criss-crosses at the junctionpoints. Another white longitudinal dotted line is found on the mid-ventral surface, beginning from the posterior end of mouth and ending on the second or fourth body ring. The margin of mouth is encircled by a dotted line of the similar nature. On the ventral surface of the head there are two black lines near the frontal margin. The white patches on the body are wanting in the present specimens, while they have been observed on the Misaki specimens by Takakura. The side-organs are indicated as a pair of rounded or elliptical yellowish red area lying just anterior to the junctionpoint of the fourth body ring and the lateral lines, and immediately dorsal to the lateral lines. Occasionally the posterior ends of the organs extend backward beyond the fourth body ring. In alcohol the anterior portion of body is greyish yellow as far posterior as the third ring. Here it abruptly changes to blackish brown till about 20th ring, and fades again into pale yellow throughout the remainder of the body. The side organs are found as clear white areas in the blackish brown region. The cephalic grooves are also distinct as white areas on each side of the neck.

Internal structure. The epithelium is thick in the head and the oesophageal regions, and contains numerous flask-shaped gland cells and compound gland cells. The latter is especially abundant in the head, being stained blue in eosin-hæmatoxylin preparations. In the intestinal region the epithelium is very thin, containing many flask-shaped gland cells and compound gland cells. Cephalic glands and frontal organs are not present. Inner circular muscle layer is well developed in the oesophageal region, thicker than the outer ones, especially much thickened immediately posterior to the mouth. Two circular muscle layers show the mutual crossings of fibres, both dorsally and ventrally at several points. The longitudinal muscle

plate is well developed between the proboscis sheath and the alimentary canal in the oesophageal region. The endothelium of the rhynchodaeum is very thick and has many compound gland cells. The proboscis sheath never extends beyond 2/3 the length of body. The vascular system is a relatively large lacuna situated dorsally and laterally to the rhynchodaeum in the head and the strands of muscle fibres pass across it dorso-ventrally at several points. Posteriorly to the mouth this lacuna becomes divided into two lateral vessels, and the muscle fibres crossing the cavity are no more found. A short distance posterior to the mouth a pair of rhynchocoel blood vessels are separated off from the laterals and run posteriorly along them,

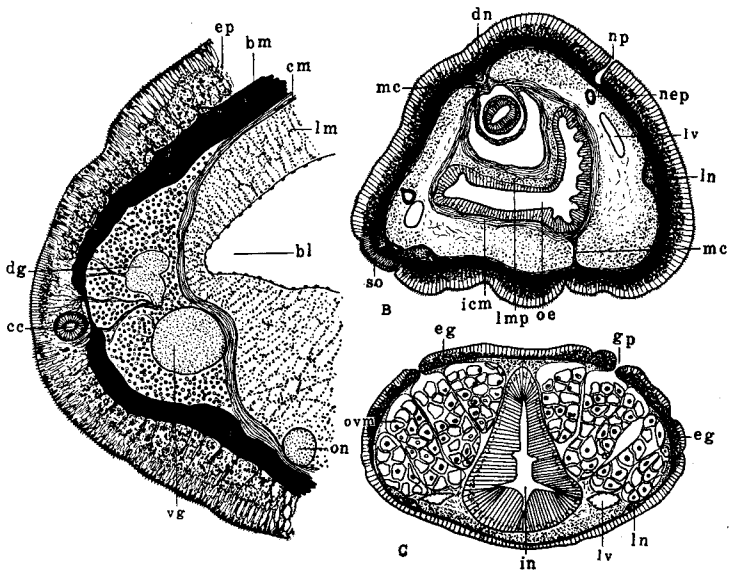


Fig. 2. *Tubulanus punctatus*; A. Cross section through anterior portion of mouth. ×65; B. Cross section through side organ. ×23; C. Cross section through intestinal region. ×45.

projecting into the rhynchocoel, and shortly afterwards they rejoin the laterals. Just in front of the ventral commissure of brain a pair of nerves are given off for the proboscis. Another pair of nerves originate from the ventral ganglia just posterior to the commissure and innervate the oesophagus. A median dorsal nerve separates off from the dorsal commissure and runs anteriorly and posteriorly

between the basement membrane and the circular muscle layer. The post-lateral corners of the cephalic grooves penetrate into the head as cerebral canals towards the brain. At first they are shallow epithelial furrows, but later become canals reaching the basement membrane, innervated from the posterior angle of the dorsal ganglia, but never penetrate the basement membrane. The epithelium of the cephalic grooves differs from adjacent epithelium in lacking gland cells, pigments, and in having numerous nerve fibres. The side organ is also clearly marked off from the other epithelium in the absence of flask-shaped gland cells and black pigments, and in the possession of many nerve fibres and dense cilia. The genital products are ripen in May, June, and July. Each genital pouch has a single duct opening into a funnel-shaped depression on the dorso-lateral surface of the body. The epithelium of this region has many glands of eosinophile cells, the compound gland cells. Nephridia are situated immediately before the side organ on each side. Their terminal organs, nephridial glands, project into the lateral blood vessels from their dorso-lateral walls, and from these regions runs posteriorly a single large longitudinal canal on each side, lying in close contact with the dorsal walls of the lateral blood vessels. Just anterior to the 4th body ring the efferent ducts from the posterior ends of the nephridia ascend dorsally at right angle to the body axis and open on the dorso-lateral surfaces of the body.

Remarks. The present species was first described by Takakura in 1898 from Misaki, Japan, without description of internal structure. In 1934, Wheeler reported a nemertean under the name of *Tubulanus nothus* (Bürger) from South Africa, describing the internal anatomy in detail, which coincides well with the present species except that in the latter the cerebral canals barely reach the basement membrane and never penetrate through it to reach the dorsal ganglion. In the external characters and coloration Wheeler's specimens differ from the present material in the following points; (1) number of body rings, (2) the interval between the 3rd and 4th body rings, (3) length of the mid-dorsal line. But these differences may be due to individual variations, and thence Wheeler's specimen must be referred to *Tubulanus punctatus*. The neapolitan form, *Tubulanus nothus* of Bürger (1892), is nearly allied to the present form in the internal structure of body, but is quite distinct in colour and marking of head, in shape of the first body ring, and in arrangement of body rings.

Tubulanus banyulensis (Joubin) is also different from *T. punctatus*, though nearly related to it.

Habits and habitat. About 40 specimens were collected by the writer at nearly all collecting stations in Hokkaido, i.e., Akkeshi, Ochiishi, Nemuro, Abashiri, Usu, and Muroran in May, June, and July. They are found most abundantly near low water mark under stones or in crevices of rock, where they live in the transparent mucus tubes attached to stones or to other substrata. They were sometimes dredged from the muddy bottom in Akkeshi Bay. When kept in aquaria they secrete transparent mucus tubes around them, and when disturbed, their tail ends are easily cut off autotomically.

Geographical distribution. Hokkaido, and Misaki (by Takakura), Japan; Saldanha Bay (by Wheeler), South Africa. *Tubulanus nothus* Bürger was found at Naples, the Mediterranean Sea, and Plymouth.

Tubulanus ezoensis sp. nov.

(Pl. I, figs. 3, 4; Textfigs. 3, 4)

The body is long and slender, 30 cm long and 2–2.8 mm wide; widest in the oesophageal region, rounded in cross section, anteriorly and posteriorly with somewhat flattened ventral surface. The head is broad, flattened dorso-ventrally, round in outline, and distinctly marked off from the oesophageal region by folding of the integument, the cephalic groove. When contracted the head is withdrawn a little into the oesophageal region just as the everted proboscis is retracted into its sheath. The oesophageal region is narrower than the head and the intestinal region gradually tapers posteriorly. The posterior end of the body was cut off. The proboscis pore is a small subterminal pit. The mouth is a small slit and its lateral lips lead forward on both sides to the cephalic grooves. An inverted V-shaped groove of the epithelium is situated slightly posterior to the cephalic groove, on the dorsal surface of he body, and on the ventral surface it extends to the posterior corner of the mouth slit.

The body is bright vermilion in the head and in the oesophageal region, while the intestinal region is chestnut brown, becoming gradually paler to yellowish brown posteriorly. The ventral surface

of the intestinal region is paler than the dorsal surface and nearly yellow, without brownish tone. White rings on the ground colour are very characteristic; the first white body ring is found on the neck constriction and on the ventral surface does not extend beyond the half way to the mouth slit; the second one is situated about five times the body breadth posterior to the first one; the 3rd situated three times the body breadth posterior to the second, while the following rings are closely arranged and completely encircle the body, large and small rings alternative in turn. On each side of the body is scarcely found a longitudinal lateral line by the aid of a hand lens, being paler than the ground colour. The anterior border of the head is white and two white tubercles are found on the dorso-lateral surface of the body just anterior to the third white body ring.

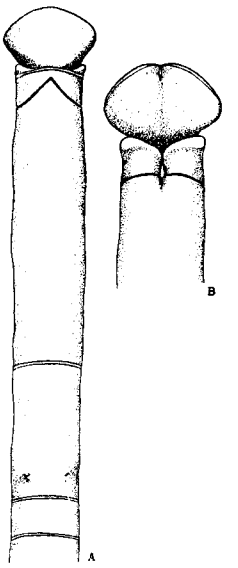


Fig. 3. *Tubulanus ezoensis* sp. nov.; anterior portion of body; A. Dorsal view. ×4.5; B. Ventral view. ×5.

Internal structure. In the oesophageal region, a very thin layer of longitudinal muscle fibres is found between the oesophagus and the proboscis sheath, and the inner circular musle layer, being a little thinner than the outer ones, is observed at the oesophageal region. Two circular muscle layers show no indication of a mutual crossing of fibres either above or below. Two large proboscis nerves are branched off from the ventral commissure of the brain. The rhynchocoel nerve extends posteriorly beyond the oesophageal region. A median dorsal nerve runs posteriorly outside the circular muscle layer. The oesophageal nerves in a pair are branched off from the ventral commissure of the brain and cross once with each other just in front of the mouth, running posteriorly along the both sides of the mouth to the oesophageal region where they soon disappear. The cerebral sense organs are represented entirely by epithelial canals; at first they are shallow epithelial pits on both lateral sides of the cephalic groove and penetrate as the epithelial canals into the head towards the brain to the basement membrane, where they are inner-

vated from the dorsal ganglia. Frontal organ is wanting. Cephalic glands are enormously developed around the cephalic blood lacunae and the rhynchodaeum. Nearer the brain region they become dispersed more and more until they disappear just in front of the brain, but situated external to the blood lacunae. Most of the anterior glands are believed to pour out their secretion at the tip of snout, and those situated farther back open externally through the body wall on the lateral surface of the body. Rhynchocoel vessels in a pair are projected into the rhynchocoel on both the lateral sides at the anterior region of the oesophagus, and are connected with the lateral blood vessels at several places. The dorsal blood vessel is wanting. Nephridia are situated in the posterior third of the oesophagus. A single winded canal on each side, lying in close contact with the dorsal wall of the lateral blood vessel, opens externally on the dorso-lateral surface of the body at its posterior end. The white tubercles are situated on the dorso-lateral surface of the body just in front of the third white body ring. The structure of them could not be examined in the serial preparations.

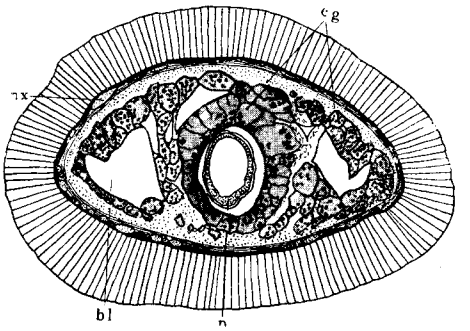


Fig. 4. *Tubulanus ezoensis* sp. nov.; cross section through anterior portion of head. ×22.

Remarks. The present species, at a glance, resembles *T. punctatus, T. albocinctus* and *T. rubicundus,* but quite differs from them in details of the external and internal characters. The main characters by which the present species is easily distinguished from other described species of the genus are in (1) the coloration and markings of the body, (2) the possession of the two white tubercles on the dorsolateral surface of the body and the absence of the typical side organs, (3) the possession of the cephalic grooves formed by folding of the integument and (4) the absence of the mutual crossing of fibres between two circular muscle layers of the body.

Habits and habitat. Only two specimens are found near low water mark under a stone in June at Daikoku-jima, Akkeshi. They live in white mucus tubes attached to the stone, as *Tubulanus punc-*

tatus does, and their posterior portions of the body are easily cut off into fragments autotomically. One of them was female with ripen gonads.

Family 2 Cephalotrichidae McINTOSH, 1874
Genus *Cephalothrix* OERSTED, 1843

Cephalothrix linearis (RATHKE, 1799)

(Pl. I, figs. 5, 6, 7, 8; Textfigs. 5, 6)

Cephalothrix linearis: BÜRGER, 1895, Fau. u. Flo. Neapel, S. 539, Taf. II, Fig. 20; ——, 1902, Tierreich, S. 18; TAKAKURA, 1898. Zool. Mag. 10, pp. 119–120; COE, 1901, Harriman Alaska Exp., XX, pp. 19–20; ——, 1905, Nemerteans of West and Northwest coasts of America, pp. 153–154; WIJNHOFF, 1910. Zool. Jahrb. 30, S. 427–534; ——, 1913, Zool. Jahrb., 34, S. 291–317; FRIEDRICH, 1935, Arch. f. Naturg., 4, S. 305–306; ——, 1936, Nord- u. Ost-See, IV, S. 31.

Cephalothrix spiralis: COE, 1930, Zool. Anz., 89, pp. 101–103.

External characters. The body is extremely slender and thread-like, 20–40 cm long or more and 1–2 mm wide, rapidly tapering toward both ends. Anteriorly it is tubular, but the intestinal region is somewhat flattened dorso-ventrally.

The head is rounded, and can not be distinguished from the rest of the body, without ocelli and any other markings. The proboscis pore and the mouth are small longitudinal slits on the mid-ventral line of the head, the former situated at the tip of snout and the latter a litter posterior to the commencement of the oesophagus, with the distance from the tip of snout 2 to 3 times the breadth of the body. When moving actively the anterior portion of body is being bended with the pouting mouth foremost, which is probably used as a kind of sucker as McIntosh mentioned. The body is generally dark yellow, dull white, or reddish yellow, with a characteristic red patch on the snout. Specimens without this red patch are very rarely met with. The anterior portion of the body, the head, and its immediately succeeding oesophageal portion are rosy or pinkish except the whitish yellow portion between the red patch and the mouth. In immature animals the remaining posterior portion of the body is dark yellow with or without greenish tinge. When matured, this portion becomes opaque white in male and rosy yellow in female, with the median line dark yellow which is due to the intestine and proboscis sheath.

For the sake of this colour, the males are distinguished easily from the females. By the fixation remarkable transverse folds are formed, and in alcohol the body becomes equally yellowish white in colour without markings. The mouth is opened roundly with the lip folded many times, bending the body backward at this point.

Internal structure. The basement membrane of the body is in most parts two times or more thicker than the circular muscle layer which is very thin. The longitudinal muscle layer is well developed. The inner circular muscle layer is very thin beneath the oesophagus and on the latero-ventral sides of the lateral blood vessels. The longitudinal muscle plate beneath the proboscis sheath consists usually of only a single layer of fibres, as Coe (1930) pointed out. The preoral region is filled up by the so-called 'Nerv-Drüsengewebe', consisted of many nerve fibres, cephalic glands, and a few longitudinal muscle fibres. The proboscis sheath reaches posteriorly about the middle of the body. The distance from the brain to the mouth is about 2.5 times the distance from the snout to the brain. Two pairs of cephalic nerves are separated off from the dorsal and ventral ganglia, running forward along the dorsal and ventral surfaces of the rhynchodaeum respectively. The posterior end of the dorsal ganglion is not branched off. A pair of the oesophageal nerves are separated off from the posterior ends of the both ventral ganglia, and run posteriorly beneath the proboscis sheath. They are at first closely approached together, soon become united to one, and then are separated again from each other, becoming gradually narrower posteriorly. They run close to the ventro-lateral surface of the foregut, regain their dimension, and thence soon disappear behind the mouth. A median dorsal nerve is situated between the basement membrane and the circular muscle layer. The cerebral sense organ and cephalic

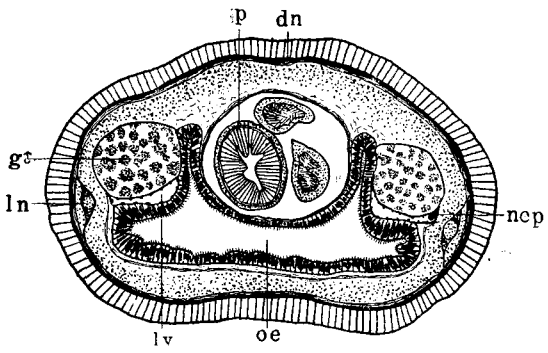


Fig. 5. *Cephalothrix linearis*; cross section through oesophageal region. ×30.

furrows are not found. The nerve plexus surrounds the body under the basement membrane. The reproductive organs are situated immediately on the dorso-lateral sides of the intestine and the lateral blood vessels, beginning from the oesophageal region posteriorly. The gonads are ripen in May, June and July, and especially in June they are so well matured that when touched, their genital products are entirely spout out in 20 or 30 seconds, even when kept in aquaria for a long time without any stimulus. Individuals with empty gonads were collected in July. The artificial insemination is easily performed. Nephridia are very aberrant; there are numerous isolated nephridia projecting into the lateral blood vessels from ventral walls. They are most plentiful in the oesophageal region and become fewer posteriorly. Each of them consists of a multinucleate mushroom-shaped terminal organ (nephrostome) and a slender canal leading to a convoluted tubule immediately beneath the wall of the blood vessels. The efferent duct was not found by the present writer. The terminal organ lies in a thin walled terminal chamber in close contact with the endothelium of the blood vessels and bears on its free border a number of short flagella.

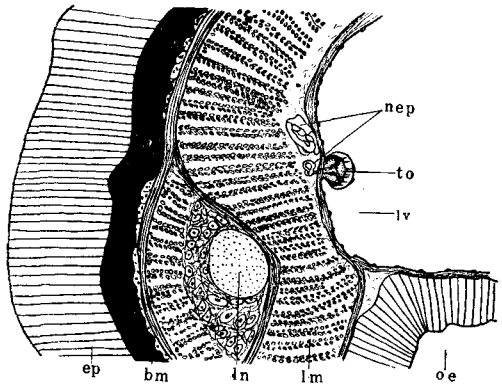


Fig. 6. *Cephalothrix linearis*; terminal organ of nephridium. Cross section through oesophageal region. ×150.

Remarks. The present author identified the nemertean in question as *Cephalothrix linearis* (Rathke), from the following features; (1) the red patch on the snout, (2) possession of the cephalic glands, (3) the gonads situated in dorsolateral position of blood vessels, (4) the presence of isolated nephridia, (5) and in the absence of the parenchyma in the preoral region. In the present material, however, the brain and the mouth are more closely approximated together than in the description of many writers.

Habits and habitat. This species is very common under stones on sandy beach near the high-water mark in May, June, and July at

Akkeshi. Two, three or sometimes more individuals are found entangled with each other under a stone, and it is often difficult to loose them out separately. In Hokkaido the species was found only at Ochiishi and Akkeshi. This nemertean can easily be kept in aquaria, without giving any food as long as three months in summer by the present author.

Geographical distribution. Hokkaido, and Misaki (by Takakura), Japan; Alaska, the Atlantic Ocean (Europe and North America) and the Mediterranean Sea.

Order 2 HETERONEMERTINI
Family 1 Lineidae McINTOSH, 1874
Subfamily 1 Lineinae BÜRGER, 1904
Genus *Lineus* SOWERBY, 1806

Lineus torquatus COE, 1901

(Pl. I, figs. 9, 10, 11, 12, 13, 14; Textfig. 7)

Lineus torquatus: COE, 1901, Harriman Alaska Exp., pp. 66–68, pl. V, figs. 8–9; ——, 1905, Nemerteans of West and Northwest coasts of America, pp. 163–164, pl. III, fig. 28.

External characters. The body is slender, thread-like 30–100 cm or more in length and 2–5 mm in width. The head is short, spatula-shaped, and marked off from the immediately following region by a slight annular constriction, and on its both sides are running the horizontal cephalic furrows which begin from the anterior corners of the head and reach backward the constriction. Ocelli are wanting. The proboscis pore is a minute terminal slit, and the mouth is also a small slit situated just behind the posterior end of the cephalic furrows. The oesophageal region is somewhat rounded above and flattened below, and the intestinal region, strongly depressed dorso-ventrally but without thin margins, is tapering to a pointed end. The body is commonly red, sometimes chocolate-coloured, deeper dorsally than ventrally, and with flecks of irregular minute, inconspicuous yellowish white on the dorsal surface. A transverse yellowish white band passes across the dorsal surface near the posterior ends of the cephalic furrows. This characteristic marking reaches only the lateral edges, and never extend to the ventral surface. Furthermore, the antero-dorsal margin of the head is coloured white. The cephalic

furrows are red as the general colour of the body. In alcohol the red colour is usually retained with transverse white band and the white marking at the anterior margin of the head.

Internal structure. The cutis is consisted of many eosinophile glands and connective tissue, and well marked off from the outer longitudinal muscle layer. The dorso-ventral muscle fibres are absent. Cephalic glands are extended backwards to the middle between the tip of snout and the brain. The proboscis, white in colour and tinged with pale red, is entirely deficient in the inner longitudinal muscle layer, and is provided with only one muscle cross. A pair of probosicis nerves originate from the ventral commissure of the brain. The proboscis sheath never extends beyond 2/3 the length of body. Salivary glands are well developed. The nerves extending from the brain toward the tip of snout are numerous and are all of large size. A pair of the oesophageal nerves are separated off from the ventral commissure and run posteriorly beneath the median blood lacuna. They are connected twice with each other by the transverse commissures and the posterior junction point occurs just in front of the mouth. They are situated on the ventro-lateral sides of the mouth respectively, and just posterior to the mouth they branch off into many nerves and soon disappear. The communication between the oesophageal nerves and the lateral nerves is not found. A median dorsal nerve is situated in the oesophageal region just outside the circular muscle layer and the inner dorsal nerve is lacking. Cerebral sense organs are voluminous and their canals open externally on the papillae situated in the posterior widened end of each of the cephalic furrows. Nephridial canals are found only in the anterior oesophageal region; anteriorly they lie mainly dorsal to the lateral nerves but posteriorly they are found also on the ventral sides of the lateral nerves. A pair of efferent nephridial ducts are situated

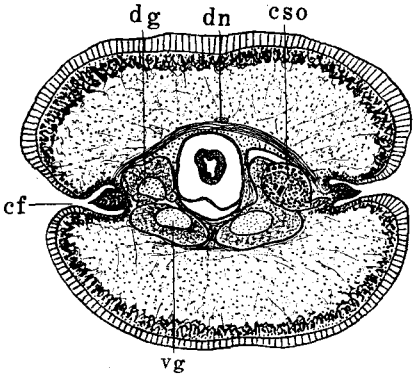


Fig. 7. *Lineus torquatus*; cross section through posterior portion of cerebral sense organ. ×15.

at the posterior ends of the nephridia and open externally on the lateral surfaces of the body just dorsal to the lateral nerves.

Remarks. The present material differs from the Alaskan form described by Coe in 1901 in the following characters; (1) the shape and colour of the tip of snout, (2) the number of the muscle crosses of the proboscis and the mutual connections of the oesophageal nerves, (3) the want of communications between the oesophageal nerves and the lateral nerves, (4) the lack of the inner dorsal nerve and (5) the situation of the efferent nephridial ducts to the posterior ends of the nephridia.

Habits and habitat. This form is found between or under stones at or below low water mark at Akkeshi, Ochiishi, and Nemuro. In April and May these nemerteans are never found on the beach, but in warmer season of the year, June and July, they are found near low water mark. Each of the individuals is usually coiled and entangled into an irregular mass, very sluggish in movement, and unnable to swim. They are not broken up nor contracted excessively when thrown into killing fluid, and the proboscis is usually not everted when killed.

Geographical distribution. Hokkaido, Japan; Prince William Sound, Alaska (by Coe).

Lineus alborostratus TAKAKURA, 1898

(Pl. II, Figs. 1, 2, 3, 4, 5; Textfig. 8)

Lineus alborostratus: TAKAKURA, 1898, Zool. Mag., 10, p. 332, fig. 12.

External characters. The body is enormously long and slender, 50–100 cm long and 2–10 mm wide, convex on the dorsal surface and flattened on the ventral surface. The head is just like the serpent's head in shape; it tapers to a blunt anterior end and becomes broad posteriorly, being marked off from the succeeding oesophageal region by a constriction. The oesophageal region is somewhat rounded in cross-section, while the intestinal region is strongly flattened dorso-ventrally and posteriorly tapering to a pointed end. The proboscis pore is situated at the tip of snout, so that the anterior end of snout is often slightly concave. The horizontal cephalic furrows do not reach anteriorly quite the tip of snout but posteriorly reach the narrow portion of the head. Their inner margins are coloured white

and the inner surface is red. The mouth is a slit, situated as far back as the posterior end of the cephalic furrows. The body is equally blackish violet on the dorsal surface and somewhat paler ventrally, and the tip of snout is always white. This white area is bordered on the coloured portion clearly on the dorsal surface, but on the ventral surface its border is inconspicuous.

Internal structure. The cutis is about two times the thickness of the epithelium in the oesophageal region and its glands are well developed and clearly marked off from the outer longitudinal muscle layer. The proboscis is composed of an outer longitudinal and an inner circular muscle layer, and is provided with two muscle crosses. The inner longitudinal muscle layer is wanting. The rhynchocoel extends posteriorly to the middle portion of the body. The cephalic glands are well developed in front of the brain both above and below the rhynchodaeum, and never extend posteriorly beyond the brain. The frontal organs, three characteristic canals, are found on the tip of snout: each of them originates as the invaginated epithelium of the ventral surface of snout, passing into the tissue of the head and ending freely near the anterior ends of the cephalic furrows. One of them is situated on the median line above the rhynchodaeum, and the other two are placed symmetrically on the ventro-lateral sides of the rhynchodaeum. The canals are provided with long cilia and a great quantity of small granules, but are never provided with the glands. These frontal sense organs are easily overlooked in living animals, but very conspicuous in the sectioned preparations. The dorsal ganglion of the brain is divided posteriorly into two lobes, of which the dorsal small lobe ends freely, while the ventral large lobe continues into the cerebral sense organ which opens externally by the canal at the posterior end of the cephalic furrow. In the oesophageal region, the nerve plexus is well developed surrounding the outer surface of the circular muscle layer. The oesophageal nerves, large and quite conspicuous, originate from the ventral ganglions and have

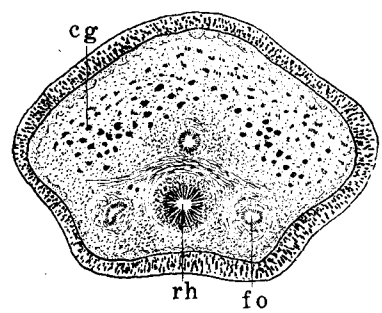


Fig. 8. *Lineus alborostratus*; cross section through anterior end of head. ×30.

a transverse connection between them and the lateral nerves. A median dorsal nerve is present. Nephridia are situated in the anterior portion of the oesophageal region and are composed of numerous canals in the outer walls of the blood lacunae lying above and below the lateral nerves. Efferent ducts are large and in a pair passing through the body wall above the lateral nerves and opening externally on the dorso-lateral aspects of the body at about 2/3 the distance toward the posterior ends of the nephridia.

Remarks. The present material agrees in external features with Takakura's species, *Lineus alborostratus,* though different in larger size and narrower white area of the tip of snout. Takakura has not given accounts on the internal structure.

Habits and habitat. They are rarely found entangling together under or between stones near the low water mark in May, June, and July at Akkeshi and Ochiishi. They are sluggish in movement and unable to swimm. The gonads are overripen in July.

Geographical distribution. Yokohama (by Takakura), Hokkaido, Japan.

Subfamily 2 Cerebratulinae FRIEDRICH, 1934
Genus *Cerebratulus* RENIER, 1804

Cerebratulus marginatus RENIER, 1804

(Pl. II, Figs. 6, 7, 8; Textfig. 9)

Cerebratulus angulatus: MCINTOSH, 1874, British Annelids, pp. 195–196.
Cerebratulus marginatus: BÜRGER, 1895, Fau. u. Flo. Neapel, S. 660–663, 80, figs.; ——, 1903, Tierreich, S. 112–113; COE, 1905, Harriman Alaska Exp., pp. 75–76, 1901; ——, 1905, Nemerteans of the West and Northwest coasts of America, pp. 193–194, Textfigs. 29–30.

External characters. The body is large in size and ribbon-like in shape, 15–30 cm long and 8–15 mm wide, with flattened ventral and convex dorsal surfaces. The head is lanceolate-shaped, marked off from the succeeding portion of the body, and provided on both sides with deep horizontal cephalic furrows which are separated in front but without ocelli or any other markings. Proboscis pore and mouth are longitudinal slits on the mid-ventral line, the former is very small and situated subterminally at the tip of snout, and the latter is large, opening behind the posterior ends of the cephalic furrows. The

oesophageal region is somewhat elliptical in cross section and widens gradually towards the intestinal region which is in cross section very flat and broad with thin lateral margins to adapt for swimming. From the posterior third of the body it narrows gradually to a blunt end which is provided with a delicate white caudal cirrus. The body is equally dull yellowish brown with the white margins. The inner surfaces of the cephalic furrows are red and bordered with white margins. The oesophageal region is tinged with red, and proboscis is dark yellowish brown. The nemerteans are hardly fixed in good condition, because the body is liable to be autotomically cut off into numerous fragments and the proboscis is apt to be given off in the fixing agents. In alcohol the oesophageal region is thicker and narrower than in life, and the lateral margins of the body are clearly marked as thin membranes.

Internal structure. In the oesophageal region the cutis is three times or more thicker than the epithelium and is provided with glands and lamellae of the connective tissue fibres. The connective tissue fibres encircling the body in many layers clearly separate the cutis from the outer longitudinal muscle layer. Radial and dorso-ventral muscle fibres are well developed; the former are most plentiful in the head and oesophageal regions, and the latter form thin broad plates intervening with the intestinal pouches and are found as strings in the lateral ridges of the body. Cephalic glands are well developed and extend backward to the brain. The proboscis sheath reaches the posterior end of the body. The proboscis is slender, provided with three muscle layers and two muscle crosses, but without outer circular muscle layer. A pair of the oesophageal nerves are separated off from the ventral ganglia of the brain, and communicate three times with each other and the lateral nerves, and run posteriorly at both lateral sides of the oesophagus. Frontal organ is not found. A dorsal nerve and an inner dorsal nerve are clearly found. Cerebral canals open externally into the posterior regions of the cephalic furrows and lead internally directly beneath the inner ventral border of the dorsal ganglion. Anteriorly the cerebral sense organs are situated in the middle between the dorsal and ventral ganglia and ventral to the lateral blood vessels, while in the posterior portion lie dorsal to the lateral nerves surrounded directly by the lateral blood vessels. Just posterior to the ventral commissure are found neurochord cells which lie just outside the inner neuri-

lemma of the ventral ganglia. Cephalic blood lacunae, which lie close to the rhynchodaeum dorsally and laterally, are divided in many places into 3 or 4 chambers by the muscle bundles, and become two lateral blood lacunae just posterior to the insertion point of the proboscis. Near the dorsal commissure of the brain, they communicate once with each other beneath the proboscis sheadth. A dorsal blood vessel and a median oesophageal blood vessel are separated off from this ventral commissure of the blood vessel. The dorsal vessel running posteriorly, projects into the rhynchocoel from the mid-ventral wall. The median oesophageal vessel communicates with the lateral blood vessels in several places and is divided into two vessels situated side by side in the posterior portion of the cerebral sense organs, finally giving rise to many vessels surrounding the oesophagus. The nephridial canals, profusely branched, lie in contact with the blood vessels around the oesophagus except the ventral ones at the anterior portion of the oesophagus, and posteriorly are limited to the lateral blood vessels.

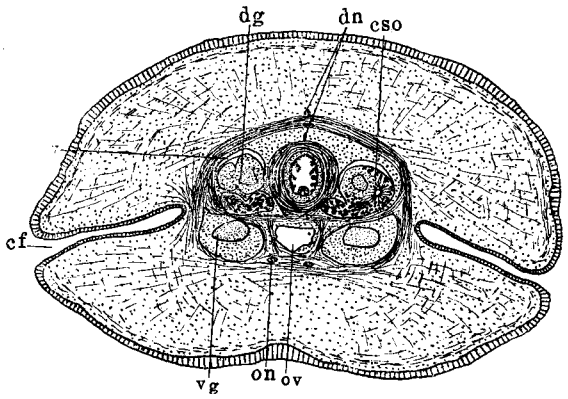


Fig. 9. *Cerebratulus marginatus*; cross section through a point in front of mouth. ×14.

Habits and habitat. The worms are commonly found near low water mark living in soft mud or in fine sand under stones at Akkeshi. These substrata are rich in decomposed organic matter and hydrogen sulphide gas. The nemerteans can swim actively, with their cephalic furrows widely opened and violently undulating the body. They are very rapid in burrowing into the substrata, and when touched, or stimulated by the fixatives, they are cut off into numerous fragments.

Geographical distribution. Hokkaido, Japan; the Atlantic Ocean (Europe and North America); the Mediterranean Sea; Sitka, Alaska; Greenland.

Genus *Micrura* EHRENBERG, 1831

Micrura alaskensis COE, 1901

(Pl. II, figs. 9, 10; Textfig. 10)

Micrura alaskensis: COE, 1901, Harriman Alaska Exp., pp. 71–74; ——, 1905, Nemerteans of the West and Northwest coasts of America, pp. 187–188.

External characters. The body is 10–15 cm long and 2–4 mm wide, being thickened in the oesophageal region and flattened dorso-ventrally throughout the whole intestinal region. The head is lanceolate, flattened dorso-ventrally, and scarcely marked off from the oesophageal region. The anterior ends of the horizontal cephalic furrows do not reach the proboscis pore which is situated at the tip of snout, and their posterior ends reach the broadest portion of the head. The mouth is a small pit, lying a little behind the posterior end of the cephalic furrow. Ocelli are wanting. The oesophageal region is well rounded in cross-section, and narrower than the succeeding portion of the body. The intestinal region is much flattened, while its lateral margins are rounded. Posteriorly the body tapers gradually to a blunt end with an unusually long, white caudal cirrus. The body is generally salmon-coloured. The head is yellowish white on both dorsal and ventral sides, and the reddish brown brain is visible through the body wall, and the periphery of the mouth is pale yellow. The oesophageal region is bright salmon, becoming lighter anteriorly. The intestinal region is pale salmon, with much more deeply coloured proboscis sheath, white proboscis, and enormously numerous white gonads which are closely arranged in parallel transversal rows on both sides of the proboscis sheath. A characteristic, narrow flesh-coloured stripe is found running through the whole length of the mid-ventral surface of the body.

Internal structure. At the anterior portion of the body, the characteristic, thick connective tissue layer is found just outside of the circular muscle layer which gives rise to many branches interweaving the outer longitudinal muscle layer. The proboscis is composed of the longitudinal and the circular muscle layers and is provided with two muscle crosses. It is quite strange that the inner longitudinal muscle layer of the proboscis is lacking. At the posterior end of the oesophagus, muscle layers surrounding the epithelial lining of the oesophagus are well developed to a conspicuous

thickness. The accessory buccal gland (Coe, 1901) around the mouth are well developed within the outer longitudinal muscle layer, being situated ventral to the lateral nerves. The ordinary buccal glands are also well developed. The three blood vessels are very conspicuous throughout their length. The dorsal vessel leaves the proboscis sheath near the anterior ends of nephridia and passes ventrally along the outer surface of the latter. The posterior end of each dorsal ganglion is bilobed, the dorsal lobe of which ends freely, while the ventral lobe continues directly into the cerebral sense organ. The cephalic furrows are very shallow and the cerebral canals open into the posterior ends of them. Two dorsal nerves and a pair of oesophageal nerves are well developed. The nephridial system consists of a pair of unusually large, longitudinal canals, which lie in the dorsal walls of the lateral blood vessels in the anterior half of the oesophageal region. The nephridial canals send off only a few branches near their anterior ends. Longitudinal canals, in a pair, each terminates posteriorly in a single, remarkably large efferent duct which opens on the dorso-lateral aspect of the body. Each of the efferent ducts is dilated into a broad chamber as it passes through the circular muscle layer. The gonads are well ripen in April and May, and the contents are spout out instantly when touched.

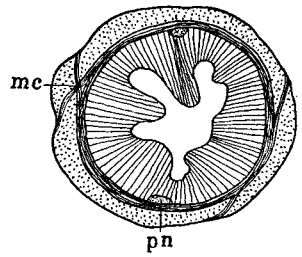


Fig. 10. *Micrura alaskensis*; cross section of proboscis. ×100.

Remarks. The present material is identical to the Alaskan form, *Micrura alaskensis* Coe, 1901. Only the following two points are added by the present writer to Coe's description; (1) the proboscis consists of two muscle layers and is deficient in inner longitudinal muscle layer, (2) a thick connective tissue layer is found just outside of the circular muscle layer at the anterior portion of the body.

Habits and Habitat. This worm is found under stones on the beach in April and May at Akkeshi. Often several worms are found entangled in a mass together with *Cephalothrix linearis* (Rathke). They are unable to swimm and are apt to be cut off in pieces autotomically in their breeding season.

Geographical distribution. Hokkaido, Japan; Alaska and California (by Coe).

Micrura akkeshiensis sp. nov.

(Pl. II, figs. 11, 12, Pl. III, fig. 1; Textfig. 11)

External characters. The body is small and slender, 15–20 cm long and 1–2 mm wide, slightly flattened dorso-ventrally and bluntly tapered to both ends. The head, lanceolate in outline, is a little narrower than the rest of the body and barely marked off from parts immediately following by the constrictions on both lateral sides. Horizontal cephalic furrows are rather long, extending backward to the constrictions, but not reaching anteriorly the tip of snout, where the proboscis pore is situated. The mouth is a small, round pit and situated a little posterior to the constrictions. Ocelli are wanting. The oesophageal and intestinal regions are almost of the same width throughout, and a little flattened dorso-ventrally, but never flattened so strongly as to produce thin lateral margins as in *Cerebratulus*, and well rounded in cross section in the preserved specimens either in alcohol or in formalin. The posterior end of the body is provided with a white, small caudal cirrus. The body is whitish cream in colour, tinged with rose or dark green. The head and the oesophageal region are yellowish rose and always paler than the body. The brain and the inner surfaces of cephalic furrows are coloured bright red. When the gonads are ripen, the male is white and the female is rose.

Fig. 11. *Micrura akkeshiensis* sp. nov.; anterior portion of body. Ventral view. ×5.

Internal structure. A small number of dorso-ventral muscle fibres are found near the posterior end of the body between the intestinal lobes which are not so deep. The cutis glands are limited to the outer portions of the outer longitudinal muscle layer throughout the body and never sink inwards to the circular muscle layer. The inner longitudinal muscle layer is remarkably thin in the intestinal region. Cephalic glands are well developed in front of the brain and particularly massed beneath the rhynchodaeum. The proboscis sheath extends to the posterior extremity of the body, and the proboscis is provided with three muscle layers and two crossings of muscle fibres. The dorsal ganglion of the brain is about two times larger than the ventral one and is divided posteriorly into two distinct lobes, of which the dorsal lobe ends shortly, while the ventral

one continues into the cerebral sense organ. Each of the cerebral sense organs is enormously voluminous opposite to the inner-dorsal portion of the ventral ganglion, and anteriorly communicates with the enlarged posterior end of the cephalic furrow by means of a cerebral canal, and posteriorly ends freely near the mouth surrounded directly by the blood vessel. A pair of buccal nerves, branched off from the posterior ends of the ventral ganglia, communicate with each other in front of the mouth and run posteriorly along the mouth, and soon disappear. A median dorsal nerve is situated just outside of the circular muscle layer, without neurochord cells. The frontal sense organs are lacking. The blood vessels are as usual. The dorsal blood vessel projects into the rhynchocoel anteriorly and passes through the circular muscle layer of proboscis sheath to its just mid-ventral outside immediately after the mouth, and runs posteriorly. The nephridial canals extend from near the mouth to only anterior portion of the oesophagus, ramifying and twisting in close contact with the oesophageal blood lacunae and open externally on the dorso-lateral surface of the body by an efferent duct on each side, at a little anterior portion of the ends of the nephridia.

Remarks. The present species resembles *Micrura albida* in the general shape and coloration of the body, but differs from the latter in the following two points; (1) the body is a little larger and (2) the mouth is situated a little posterior to the hind ends of cephalic furrows. This form also resembles in appearance *Cerebratulus communis* Takakura (1898) but is generically quite different. The soft slender body, the uniform dull colour without distinct markings of the whole body, red colour of the inner surface of cephalic furrows and a transverse communication of oesophageal nerves, are the most characteristic features of the present form.

Habits and habitat. The present species is very common under stones on sandy beach near the high-water mark in April, May, June and July at Akkeshi and Abashiri. Two or three individuals are found entangled with each other under a stone, often accompanied with *Cephalothrix linearis,* and very sluggish in movement and are unable to swimm. The gonads are ripen in April–July. This nemertean is easily kept in aquaria without any food, and regenerating power is so predominent as to regenerate either the head or the tail in one or two weeks in June, when the body is cut in two pieces. The malformed individuals with two-forked tails or with several appendages are often found as the result of regeneration.

Micrura magna sp. nov.

(Pl. III, figs. 2, 3, 4)

External characters. The body is enormously large, 60 cm long and 5 mm wide, and somewhat flattened dorso-ventrally throughout the length of the body. The head is echelon-shaped, truncated in front, with very thin margins, and distinctly marked off from the rest of body which is narrower than the former. The horizontal cephalic furrows are very deep, extending from the antero-lateral corners to the posterior ends of the head. The dorsal wall of the cephalic furrow is broader than the ventral one and the inside of the cephalic furrow is red in colour. The proboscis pore is subterminal and the mouth is a very large, longitudinal slit, situated just posterior to the cephalic furrows. The oesophageal region becomes gradually broader toward the intestinal region which again tapers to a pointed tail-end with a long white caudal cirrus. The oesophageal and intestinal regions are elliptical in cross section and never provided with thin lateral margin. In alcoholic specimens the oesophageal region is tubular but the intestinal region is quite flattened. The body is pale yellowish-green with dark brown spots irregularly arranged in the posterior 2/3 of the body, anteriorly gradually becomes dark brown, and the head and its following portion are purely dark brown. The dorsal markings of the cephalic furrows and the dorsal side of frontal margin of head are white in colour.

Internal structure. The cutis is very thin and well marked off from the outer longitudinal muscle layer. The outer longitudinal and circular muscle layers of the body are well developed, while the inner longitudinal muscle layer is very thin. The cephalic glands are remarkably voluminous near the tip of snout, especially in those occupying the upper and lower portions of the rhynchodaeum, but lacking posteriorly near the brain. The proboscis, rose in colour, is provided with 3 muscle layers and 2 muscle crosses. The dorsal ganglion of the brain is divided posteriorly into two lobes, of which the dorsal lobe ends shortly, while the ventral one continues into the cerebral sense organ. The cerebral canal, opening externally at the enlarged posterior end of the cephalic furrow, leads through between the ventral lobe of the dorsal ganglion and ventral ganglion to the cerebral sense organ. The median dorsal nerve, lying just outside the circular muscle layer, is conspicuous throughout the whole

length of the body. A pair of buccal nerves communicate three times with each other and several small nerves are branched off in front of the mouth and run posteriorly along the both sides of the mouth. The neurochord cells are wanting. The ocelli and the frontal organs are lacking. The dorsal blood vessel projects into the rhynchocoel at the anterior portion of the oesophagus, while far posteriorly in the nephridial region it leaves from its original position toward the under side of the proboscis sheath. Nephridia are consisted of numerous, small canals projecting into the blood lacunae around the posterior portion of mouth and in the extremely anterior portion of oesophagus. The very large efferent duct, situated on each side of the body, opens externally on the lateral aspect of the body just dorsal to the lateral nerve cord at about 2/3 the distance towards the posterior end of the nephridium.

Remarks. The new species is characterized by the enormously large size of body, the echelon-shaped head, and by the presence of three communications between the oesophageal nerves.

Habits and habitat. Only one specimen was found under a stone near the low water mark on June 29th at Daikoku-jima, Akkeshi, by Mr. F. Oka. This nemertean is very sluggish in movement and is apt to twist in a mass, secreting thick mucus all around the body. The tail end of the body with its caudal cirrus is often found inverted into the body just as the introvert of the sipunculoids is withdrawn into the trunk.

Micrura bella (STIMPSON, 1857)

(Pl. 11, figs. 13, 14, 15)

Cerebratulus bellus: STIMPSON, 1857, Proc. Acad. Nat. Sci. Philadelphia, p. 17.
Micrura festiva: TAKAKURA, 1898, Zool. Mag., 10, p. 336, fig. 20.
Lineus striatus: GRIFFIN, 1898, pp. 214–215.
Micrura bella: COE, 1901, Harriman Alaska Exp., p. 71. ——, 1905, Nemerteans of West and Northwest coasts of America, p. 182.

External characters. The body is small in size, slender, and rounded, 25 mm long and 0.5 mm wide and somewhat flattened dorso-ventrally. The head is not demarcated from the rest of the body and the posterior end of the body is provided with a slender, white caudal cirrus. The coloration is very beautiful; the dorsal surface of the body is purple with 19 narrow white transverse rings throughout

the entire length of body, the lateral margins and the ventral surface white, and the anterior half of the head is vermilion. The horizontal cephalic furrows are deep and long, situated within the white coloured portions, and extend posteriorly beyond the vermilion region to the middle of the first purple band, and are well separated from each other at the anterior ends of both furrows. The proboscis pore is a small subterminal slit and the mouth is also a small pit, situated as far back as the posterior ends of the cephalic furrows. In alcohol the purple and vermilion colours are faded out, and the body is equally yellowish white.

Internal structure. The proboscis is provided with three muscle layers and the nervous plexus is situated inside the circular muscle layer, but the muscle crosses are lacking. The dorsal ganglion of brain is divided posterorly into two distinct lobes, of which the dorsal is smaller and ends shortly, while the larger, ventral extends to the cerebral sense organ. The cerebral canal opens externally on the summit of a papilla situated at the posterior widened end of each of the cephalic furrows, as in *Lineus torquatus* Coe. The dorsal median nerve, situated just outside of the circular muscle layer, is conspicuous in the anterior half of body, while it disappears posteriorly. Three frontal organs are situated at the tip of snout as invaginated epithelial canals as in *Lineus alborostratus*. The cutis is well developed, being a little thinner than the thickness of the outer longitudinal muscle layer. The outer longitudinal muscle layer is very thick, the inner longitudinal muscle layer, however, is very thin and the dorso-ventral muscle fibres are lacking. Cephalic glands are scarcely found in the region anterior to the brain both ventrally and dorsally. The cephalic blood lacunae, which lie close to the rhynchodaeum laterally and ventrally, are divided in several places into several chambers by the muscle fibres, and just behind the central commissure of brain become two lacunae situated respectively on each dorsal and ventral sides of rhynchocoel, the dorsal one of which is soon divided into two, surrounding the cerebral sense organs. Just behind the sense organs, all the lacunae are united into a large lacuna, from the dorsal wall of which the rhynchocoel hangs. The lacuna is divided into two lateral blood vessels which immediately give rise to numerous oesophageal blood vessels, surrounding the lateral and ventral walls of the oesophagus. A dorsal blood vessel is found only at the anterior portion of the body. Nephridia are

distributed throughout the anterior 2/3 of the oesophageal region and lie in close contact with the walls of the lateral blood vessels. In this region numerous efferent ducts open on the dorso-lateral aspects of the body above the lateral nerve cords. The gonads are empty in August.

Remarks. The present material differs from the Alaskan form, *Micrura verrilli* Coe, 1901, in the following points; (1) the vermilion region of the head occupies not only the dorsal surface, but also the ventral surface, (2) the posterior ends of the cephalic furrows never extend beyond the middle of the first purple bands, (3) the white rings are numbered only 19, (4) the absence of the muscle crosses in the proboscis wall, (5) the external openings of the cerebral sense organs are situated on the summits of the papillae, (6) the dorsal nerve is disappeared at the posterior portion of body, and (7) the possession of three frontal organs. *Micrura impressa* (Stimpson, 1867) from the Bering Strait resembles also the present form at a glance, but differs from the latter in the coloration of head and body, especially in the possession of the brown dots near the antero-lateral margins of the head. The present form is similar to *Micrura bella* (Stimpson, 1857) in the external characters except the colour of the dorsal surface of the body. Takakura's *Micrura festiva* from Misaki and Griffin's *Lineus striatus* (1898) from Alaska may be synonymous with *Micrura bella.* Takakura, Griffin and Stimpson have described the external characters only and nothing about the internal structure. The present author provisionally adopted the Stimpson's name, *Micrura bella,* for the present material.

Habits and habitat. A single specimen was collected on a floating, rotten wood perforated by the shipworms, *Teredo hibicola* Kuronuma, in August, 1938, at Usu. Two other specimens of this form were collected at Muroran in August, 1934 by Mr. S. Okuda, and another at Kushimoto, middle Japan in May, 1938 by Mr. M. Iwasa. The present form may probably be unable to swimm.

Geographical distribution. Hokkaido, Misaki, and Kushimoto, Japan; Alaska. *Micrura verrilli* was found at Prince William Sound, Alaska; and *Micrura impressa* at the Bering Strait.

Micrura uchidai sp. nov.

(Pl. III, figs. 5, 6, 7; Textfig. 12)

External characters. The body is rather broad in comparison

with its length, 10 cm long and 5 mm wide, and the whole body is somewhat flattened dorso-ventrally. The head is elongate, narrower than the rest of the body, emarginate in front, and narrower at the posterior ends of cephalic furrows than in their middle portion and in the oesophageal region. The oesophageal region gradually becomes broad toward the middle of the intestinal region and again becomes narrow to the pointed posterior end which is provided with a small white caudal cirrus. The body is equally purple throughout. The dorsal and ventral margins of the cephalic furrows and the tip of snout are white in colour, and a broad white transverse ring encircles the neck at the posterior end of the cephalic furrows. The proboscis pore is terminal, and the small, round mouth is situated on the mid-ventral surface of the white ring where the white area is somewhat extended over posteriorly.

Internal structure. The outer longitudinal muscle layer is enormously thick, while the inner longitudinal muscle layer is very thin. The dorso-ventral muscle fibres and the cephalic glands are lacking. The proboscis sheath is comparatively short, extending posteriorly to about the middle of body, and the structure of the proboscis is unknown, because the proboscis has been thrown off in my specimen. The epithelial layer of the oesophagus is complexly wrinkled and thin, but that of the intestine is smooth and thick. The intestinal pouches are deep and alternate with the large genital sacs. The dorsal blood vessel projects anteriorly into the rhychocoel on its ventral side and leaves towards the under side of the proboscis sheath near the posterior end of the nephridial region. The cerebral canal leads inwards to the very large cerebral organ and opens outwards into the enlarged posterior end of the cephalic furrow on each side of the body. A pair of oesophageal nerves communicate with each other four times on the way to the mouth. A median dorsal nerve is distinct just outside of the circular muscle layer of body. Three frontal organs are found on the tip of snout. Nephridia, found in the oesophageal region and in the anterior portion of the

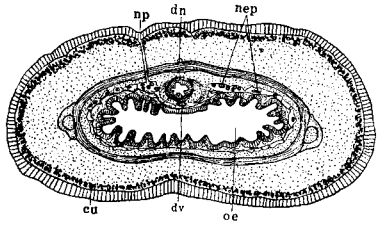


Fig. 12. *Micrura uchidai* sp. nov.; cross section through oesophageal region. ×10.

intestine, consist of numerous, twisted small canals running among the oesophageal blood lacunae. Several small efferent ducts open externally on the dorsal surface of body throughout the posterior one third of the nephridial region. In August the sexual products are ripen in the large genital pouches which open externally on the dorsal surface of the body.

Remarks. The present form is distinct from all the known species in the following features, (1) the presence of white ring around the neck, (2) the absence of cephalic glands, (3) the possession of several efferent nephridial ducts situated on the dorsal surface of body and (4) the presence of four communications between oesophageal nerves. The specific name has been chosen in honour of Prof. Dr. T. Uchida, to whom I am indebted for the kind guidance.

Habits and habitat. A single specimen of the present form was found under a stone near the low tide mark in August 13th at Muroran. This nemertean is very sluggish in movement, incapable of swimming and is apt to roll up in a mass.

Family 2 Baseodiscidae BÜRGER, 1904
Genus *Baseodiscus* DIESING, 1850

Baseodiscus curtus (HUBRECHT, 1879)

(Pl. III, figs. 8, 9, 10, 11; Textfig. 13)

Eupolia curta HUBRECHT: BÜRGER, 1895, Fau. u. Flo. Neapel, S. 601–603, Taf. 4, Figs. 3–5, 7, 9, 17.

Baseodiscus curtus: BÜRGER, 1902, Tierreich, S. 82; Takakura, 1898, Zool. Mag. 10, p. 185, fig. 7; STIASNY-WIJNHOFF, 1936, Siboga-Exp. XXII, VIII.

External characters. The body is enormously large and broad, about 35 cm long and 12–15 mm wide. The head is rounded in front, 1/4 as wide as body, flattened dorso-ventrally, and sharply marked off from the immediately following oesophageal region by lateral constrictions. These lateral constrictions lead to the transverse grooves on both sides of the ventral surface. The proboscis opening is a minute subterminal pit, and the mouth is a small slit situated far behind the transverse grooves on the ventral surface of the oesophageal region. The oesophageal and intestinal regions are both equally wide and extremely flattened dorso-ventrally, the former, however, is somewhat elliptical in cross section, while the latter is

often characterized by a median dorsal ridge extending towards the posterior end of body which is suddenly narrowed to a pointed end. When contracted, the oesophageal region becomes greatly swollen and the head is withdrawn into the oesophageal region, resulting that the whole body becomes remarkably short and thick. The body is yellow, thickly beset with minute irregular brown patches on both dorsal and ventral surfaces, except the dorsal margin and the ventral surface of head which are white. The ventral surface is somewhat paler than dorsal, and no brown patches are found in the mouth region. Ocelli are numerous and arranged irregularly on the white margin of head.

Internal structure. In the oesophageal region the cutis is four times as thick as the epithelium, and is composed of an outer layer of glandular tissue and a thicker inner layer of connective tissue, and clearly distinguished from the outer longitudinal muscle layer. The outer longitudinal muscle layer is about equal in thickness to the other two muscle layers combined in the oesophageal region. In the intestinal region the inner longitudinal muscle layer becomes extremely thin, being reduced to 2–3 layers of muscle fibres on the lateral sides of the body, while on the dorsal and ventral sides this layer retains its thickness. The cephalic gonads are enormously developed. They surround the brain on all sides, and are extended still further backwards into the anterior oesophageal region, being enclosed in the outer longitudinal muscle layer around the whole circumference of body. The proboscis is short and weak, and is provided with outer circular and inner longitudinal muscle layers. The cerebral sense organs are voluminous, and closely united with the posterior lobes of dorsal brain on the external and ventral surfaces and reach nearly as far as the ventral commissure. At the anterior extremity of each cerebral sense organ, a canal passes

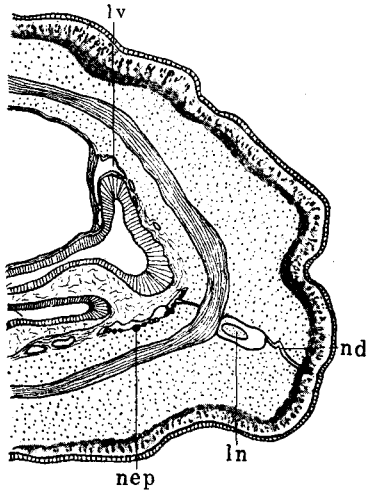


Fig. 13. *Baseodiscus curtus*; cross section through oesophageal region. ×14.

obliquelly downwards through the body wall to open into a transverse furrow on the ventrolateral aspect of the head. The sense organ, in the middle region of brain, is triangular in cross section, and farther back, the posterior glandular appendage of this organ appears at the ventro-median surface of the dorsal brain lobe and finally fuses with it more posteriorly. The brain lies nearly on the median line. The dorsal ganglion slightly exceeds the ventral ganglion in size, and lies somewhat dorso-lateral to the latter. The lateral nerves are bended sharply outward in the region of cerebral sense organs, and run posteriorly along the lateral surface of the body. The oesophageal nerves communicate once with each other just in front of the mouth. A median dorsal nerve is found clearly throughout the body. Nephridia are situated in the anterior and middle portions of oesophageal region, with several efferent ducts which pass through the body wall just above the lateral nerve cords, and open on the lateral aspects of the body.

Remarks. The present material is devoid of the longitudinal brown lines on the dorsal surface of body, and is larger than those from Naples (Bürger, 1879) and Misaki (Takakura, 1898). The present species differs from the typical form of *B. curtus* in the following external characters; (1) the body is stocky, being fairly long and very broad and (2) the possession of minute irregular brown patches on both the dorsal and ventral surfaces of body instead of the longitudinal brown lines. Bürger (1890) has described from the Indian Ocean a stocky form with brownish black speckles, just as seen in the present material. It may therefore be reasonable to identify this form with *B. curtus*. *Baseodiscus* sp. (Takakura, 1898) from Misaki resembles the present form in the possession of the speckles, but differs in its black coloration.

Habits and habitat. The worms are found between or under stones near low water mark at Daikoku-jima, Akkeshi in June and July. The genital products are partially ripen in June. The worms are very sluggish in movement and contract strongly when touched, but when killed they are not broken up into pieces and the proboscis is not everted.

Geographical distribution. Misaki (by Takakura) and Hokkaido, Japan; Naples, the Mediterranean Sea; the Southwest Indian Ocean; the South Pacific Ocean.

Subclass II ENOPLA
Order 1 HOPLONEMERTINI
Suborder MONOSTILIFERA
Family 1 Emplectonematidae BÜRGER, 1904
Genus *Emplectonema* STIMPSON, 1857

Emplectonema gracile (JOHNSTON, 1837)

(Pl. IV, figs. 1, 2; Textfig. 14)

Nemertes gracilis: McINTOSH, 1874, British Annelids, pp. 176–178, Pl. II, fig. 5.
Eunemertes gracilis: BÜRGER, 1895, Fau. u. Flor. Neapel, S. 543–544, Taf. II. Fig. 1, Taf. IX, Fig. 24, Taf. XV, Figs. 21–27, Taf. XXII, Fig. 27, Taf. XXIV, Fig. 53, Taf. XXVI, Figs. 39, 40, 41, Taf. XXVII, Figs. 1a, 12, 18, 20, Taf. XXIX, Fig. 3.
Emplectonema gracile: BRÜRGER, 1901, Tierreich, S. 22; COE, 1901, Harriman Alaska Exp. pp. 23–25, Pl. VIII, fig. 2; ——, 1905, Nemerteans of West and Northwest coasts of America, pp. 207–208, Pl. I, figs. 14, 14a, 15, 15a, Textfig. 32; FRIEDRICH, 1936, Tierwelt d. Nord- u. Ostsee, IV, d 37.

External characters. The body is very long and slender, flattened below and somewhat convex above, being 30 cm in length and 0.7 mm in width. The head is rounded in front and slightly broader than the rest of the body which posteriorly tapers gradually to a pointed end. The rhynchodeal opening is situated subterminally on the ventral surface of head as a small pit. The body is uniformly dull green above and white below. The head is bordered with white margin, and the brain is pinkish coloured and is recognizable through the dorsal body wall. A median longitudinal line of pale yellowish brown is marked on the ventral surface of body, which is probably due to the colour of intestine. Numerous ocelli are found both in the green and the white areas on the lateral borders of head from the tip of snout to the brain, and lie deeply imbedded in the tissue of the head. Rough observation was made on a single specimen, and the arrangement of ocelli was overlooked. In the present material, also, it may probably be sure that the eyes are arranged in two groups on each side of the head, as many authors has pointed out. The natural colour of the body is well retained either in formalin or in alcohol.

Internal structure. The proboscis is slender and extraordinarily short, 1/10 the length of the body. The stylet apparatus of proboscis is especially characteristic of this species. The baiss of the central stylet is very long and slender, 0.95 mm in length and three times as long as the stylet, with the posterior end which is sharply swollen into a flattened knob, 0.14 mm in diameter, but gradually tapering towards the anterior end. The central stylet is slender, 0.32 mm long, extremely sharply pointed, and is somewhat curved like a sabre. There are two accessory stylet pouches, each containing 7 to 8 slender stylets, which are 0.31 mm long and curved like the central stylet, all with pointed ends directed to the posterior end of body. The cephalic gland is wanting, but in the parenchyma multicellular glands are found well developed on the outsides of the brain. The cerebral sense organs are very small and situated just posterior to the rhynchodeal opening and far in front of the brain. These organs open each externally by a small canal on the ventrolateral aspect of the head at the anterior end of their own position. The ventral commissure of the brain is somewhat curved upward upon the oesophagus. The slender intestinal caeca, in a pair reach forward the brain and posteriorly open into the lateral walls of intestine which is provided with many small lateral swellings.

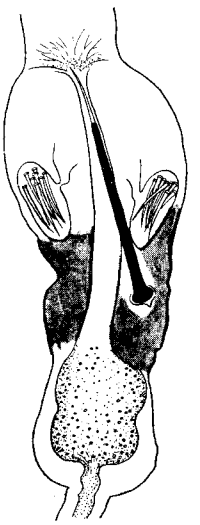


Fig. 14. *Emplectonema gracile*; stylet apparatus of proboscis. Enlarged.

Habits and habitat. The present material is found crawling on the surface of stones near low water mark at Daikoku-jima, Akkeshi in June. They are very sluggish in movement and make no effort to conceal themselves when disturbed. The gonads are ripen in June.

Geographical distribution. Hokkaido, Japan; England, Germany, France, the Mediterranean Sea and Madeira; from Victoria, B. C. to Dutch Harbor, Alaska; San Francisco, U.S.A.

*) Genus *Nemertellina* FRIEDRICH, 1935

Nemertellina minuta FRIEDRICH, 1935

(Textfigs. 15, 16)

Nemertellina minuta: FRIEDRICH, 1935, Archiv f. Naturg. N. F., 4, 3, S. 320–323, Abb. 16, 17.

External characters. The body is small and slender, 50 mm wide, and somewhat flattened dorso-ventrally. The head, rounded in front, is remarkably long compared with any other described species and of the same width to the rest of the body which is nearly equally wide the whole body throughout, and is pointed bluntly at the posterior end of the body. The rhynchodeal opening is situated at the tip of snout. Cephalic grooves are found in a pair on the anterior portion of body, of which the anterior pair is situated near the anterior end of head, while the posterior pair is found far back from the anterior one. Each of the anterior cephalic grooves extends for a short distance straight toward the median line of head on both sides of dorsal surface, but on the ventral surface meets with its fellow on the median line, bending forward and passing to the rhynchodeal opening. The posterior cephalic groove encircles the body, bending backward making a V on the dorsal surface and transverses straight on the ventral surface. Several constrictions are found on the body at irregular intervals, but is not clear whether they are normal in structure or not. Two pairs of ocelli are situated on the head, one in front of the other along the longitudinal axis of body; the anterior pair is found near the tip of snout, while the posterior one far back of the former. The body is white without any markings.

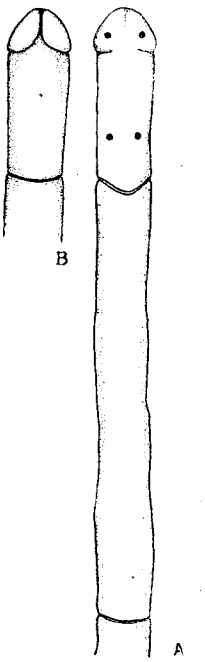


Fig. 15. *Nemertellina minuta*; anterior portion of body; A, dorsal view. B, ventral view. ×5.

* The systematic position of this genus, *Nemertellina*, is somewhat problematical; it is said that this genus belongs to the Emplectonematidae and is akin to the genus, *Emplectonema*.

Internal structure. The internal structure was not examined in detail, because the specimen was cut into pieces in the fixative. The proboscis sheath is limited to the anterior 1/3 of the body. The basis of central stylet is conical, rounded posteriorly, and is a little longer than the central stylet which is acutely pointed. The basis is 0.06 mm long and the stylet is 0.05 mm long. The proboscis is provided with two accessory stylet pouches, containing 5 and 7 stylets respectively. The diverticula of intestine are not deep, and the gonads which are ripen in June, fill up the space of body all around the intestine.

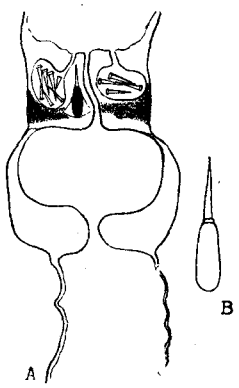


Fig. 16. *Nemertellina minuta.* Stylet apparatus of proboscis (A) and its central stylet(B). Enlarged.

Remarks. The internal structure, especially the muscle septum at the intestinal region, was not clearly observed. But the specimen seems to be referable to *Nemertellina minuta* Friedrich, by the following features; (1) the body is very small and slender, and is white in colour, and the head is rounded in the frontal margin, (2) two pairs of ocelli are separated by a long distance from each other, (3) the proboscis sheath extends only to the anterior region of body, and (4) the basis of central stylet is conical, with the length almost equal to that of stylet. Two other species of the genus; *N. oculata* and *N. canea,* have been reported from Kiel, Germany.

Habitat Only one specimen was found in the canal of the sponge, collected from several meters depth in Akkeshi Bay in July 9th, 1938. This sponge also harbours another nemertean, *Prostoma nigrifrons.*

Geographical distribution. Akkeshi, Hokkaido, Japan; Kiel, Germany (by Friedrich).

Genus *Paranemertes* COE, 1901

Paranemertes peregrina COE, 1901

(Pl. IV, figs. 3, 4, 5, 6; Textfigs. 17, 18, 19)

Paranemertes peregrina: COE, 1901, Harriman Alaska Exp., pp. 33–36, pl. II, fig. 6, pl. III, fig. 5, pl. VII, fig. 7; ——, 1095, Nemerteans of West and Northwest coasts of America, p. 220.

External characters. The body is moderately elongated, 15 cm long and 4 mm wide and posteriorly tapering to a blunt end, with flattened ventral and rounded dorsal surfaces. The head is flattened dorso-ventrally, very variable in shape, but commonly fan-shaped and wider than the portion of body immediately following. The tip of snout, however, is pointed, rounded, or emarginated according to the degree of contraction. On the dorsal surface and at the posterior border of the head there is a white V-shaped groove, which passes ventrally through lateral margins and soon disappears. Other inconspicuous grooves are situated on the ventral surface immediately anterior to the broadest portion of the head. Each of them is irregular V-shaped; its inner limb is pointed forward to the opening of the rhynchodaeum, while the outer limb passes through lateral margin to the dorsal surface and soon disappears. The opening of the rhynchodaeum is a minute subterminal slit. The body is homogenously dark violet dorsally and laterally, and yellow on the ventral surface. The sides and frontal margin of head are yellow as is on the ventral surface. The material collected at Muroran on Aug. 15, was very small, 2–5 cm long and 1 mm wide, and grey or pinkish white, scarcely tinged with violet on the dorsal surface, and their ocelli, brain, and the V-shaped cephalic groove are well recognized. The natural colour of the body is well retained either in formalin or in alcohol. Numerous minute eyes are arranged in two groups on each side of the head. The eyes of the anterior group are scattered along each side of the antero-lateral margins of the dark violet portion of the dorsal surface, and are seen only from the ventral side. The ocelli of the posterior group form an irregular cluster on each side just in front of pink brains and are well separated from the anterior group, but are recognizable only when the colour of dorsal surface is faded out.

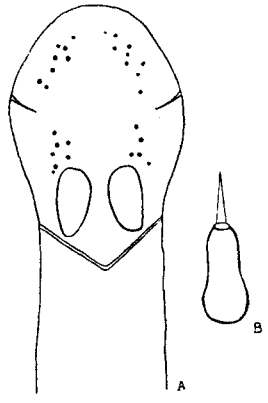
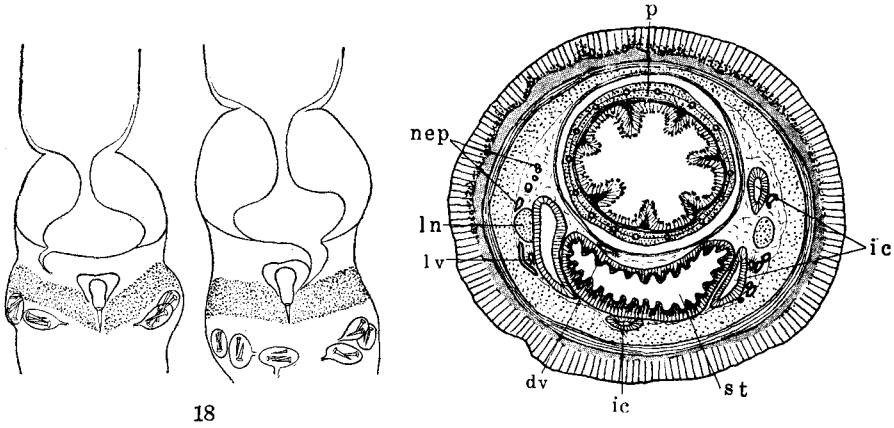


Fig. 17. *Paranemertes peregrina*; A, anterior portion of body. ×19. B, central stylet of the same specimen. Enlarged.

Internal structure. The proboscis is slightly yellowish, with a small, slender, sharply pointed central stylet, 0.07–0.11 mm of length,

and 2 or sometimes 4 or 6 pouches of reserve stylets. The basis of the central stylet is small, 0.1–0.17 mm long and 0.05–0.09 mm wide, dumb-bell shaped, and slightly enlarged posteriorly. The reserve stylets are slender and sharp like the central one, being 0.08–0.1 mm long 2 to 5 in number, sometimes 7 or 10. The proboscis sheath reaches posteriorly more than 3/4 the length of body, with 15 conspicuous nerves. Multicellular glands forming a crowded mass, occupy the anterior portion of the body from the tip of snout to the nephridial region. The anterior ones open on the tip of snout, while the posterior ones, being imbedded in the longitudinal muscle layer, open externally by innumerable ducts which pass through the mus-



18 19

Fig. 18. *Paranemertes peregrina*; stylet apparatus of proboscis. Enlarged.
Fig. 19. *Paranemertes peregrina*; cross section through middle portion of stomach. ×30.

cular and basement layers around the body. Diverticula of the intestinal caecum, in a pair and bifurcated respectively, reach forward nearly the brain commissure and lie above the lateral nerve cords. Their branches in the posterior portion run ventrally beneath the oesophagus and join with each other to form a main intestinal caecum, again sending out branches obliquely forward and dorsally at several places. The nephridia occupy anterior 2/3 the oesophageal region. They are situated above, below or lateral to the lateral nerves and are provided with numerous branches. They extend forward nearly to the brain. Several pairs of the efferent nephridial ducts open externally on the lateral aspects of the body

immediately above, below, or on the level of the lateral nerve cords throughout their course. Blood lacunae, large and in a pair in the head, join anteriorly by a broad anastomosis. The three longitudinal blood vessels are well developed till the end of the body where they anatomose above the anus. The cerebral sense organs lie far in front of the brain and at the external positions to the blood lacunae. Each of them opens into the ventral furrows on the lateral aspect of the head. The gonads are formed of numerous pouches surrounding the intestinal canal. They are ripen in April, but quite empty in August.

Remarks. The present material differs from the Alaskan forms (Coe, 1901) in the number of the proboscis nerves and the efferent nephridial ducts.

Habits and habitat. The present species is found abundantly under or between stones on the beach between tide marks at Akkeshi, Abashiri, and Muroran. They are sometimes found crawling about over stones or among seaweeds, which exposed in air at low tide. They are very slimy and prefer to entangle with each other.

Geographical distribution. Hokkaido, Japan; from Victoria, B.C. to Unalaska on the Pacific coasts of North America.

Family 2 Amphiporidae McINTOSH, 1874
Genus *Amphiporus* EHRENBERG, 1831

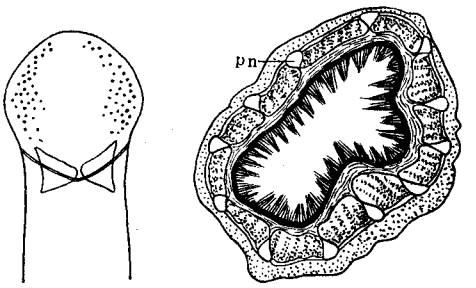
Amphiporus parvus sp. nov.

(Pl. IV, fig. 7; Textfigs. 20, 21)

External characters. The present species is small in size, 3 cm long and 1–1.5 mm wide, and flattened dorso-ventrally. The head is rounded anteriorly and a little broader than the immediately following part, and the posterior end of the body is bluntly pointed. The rhynchodeal opening is situated at the tip of snout and the V-shaped cephalic groove is found on the dorsal surface near the posterior end of the head. Numerous ocelli are found on each side of the head. The body is opal, except the anterior portion which is opal tinged with green. The brain is reddish brown and intestine is brown, both are observed through the skin.

Internal structure. The proboscis sheath extends to the posterior end of the body. The proboscis is provided with 12 nerves, a central

stylet and two lateral pouches, each of the pouches contains 3 accessory stylets. The stylet apparatus of the proboscis could not be observed in life. Measuring from serial sections, the basis is about 2.5 times as long as the stylet itself; the basis is 0.38 mm long and 0.11 mm wide and the stylet is 0.14 mm long. The cephalic glands are well developed, extending backward nearly to the posterior end of the brain. The diverticula of the intestinal caecum extend forward into the posterior ends of the dorsal ganglia. The cerebral sense organs are very small in comparison with the brain and are situated a short distance in front of the brain, with their canals opening externally on the lateral sides of the snout. The nephridial canals extend from the ventral commissure of brain to the posterior end of pylorus, twisting just on the dorso-lateral sides of lateral nerve cords. A single pair of efferent nephridial ducts open on the ventro-lateral surfaces of the body at a short distance behind the brain. The gonads are found continually along both sides of the alimentary canal, instead of alternating with the intestinal pouches.



20 21

Fig. 20. *Amphiporus parvus* sp. nov.; anterior portion of body. Dorsal view. ×6.

Fig. 21. *Amphiporus parvus* sp. nov.; cross section of proboscis. ×200.

Remarks. The present species is characterized mainly by the following features; (1) the colour of body is white, (2) the proboscis is provided with 12 nerves, (3) the cerebral sense organs are situated a little anterior to the brain and (4) the intestinal caeca extend forward to the posterior ends of the dorsal ganglions.

Habitat. Only one specimen was found on sandy beach at Akkeshi in May.

Genus *Zygonemertes* MONTOGOMERY, 1897

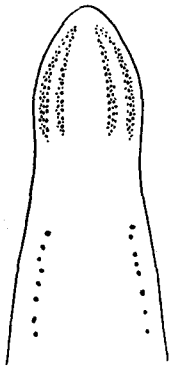
Zygonemertes glandulosa sp. nov.

(Pl. IV, fig. 8; Textfigs. 22, 23, 24)

External characters. The body is small and slender, 10–15 mm long and 0.5–0.7 mm wide, and somewhat flattened dorso-ventrally

just as in *Amphiporus*. The head is bluntly pointed and a little broader than the parts immediately following, and the posterior extremity of the body is tapered to a blunt end. The rhynchodeal opening is situated subterminally. Ocelli are small and numerous, and grouped into four longitudinal rows, the two anterior rows are double and running on lateral sides of the head, while the posterior ones have 7–8 ocelli in each rows and situated along the lateral nerve cords far behind the brain. The body is pale blue, with the alimentary canal yellowish when seen through the skin. The both sides of the intestine are green.

Internal structure. The sub-muscular glands are well developed from the head to the anterior portion of the intestine, surrounding the body just inside the longitudinal muscle layer. The proboscis is pale blue in colour and is very short in comparison with the proboscis sheath which reaches the posterior end of the body. The central stylet is remarkably short, being 0.14 mm in length and bluntly pointed. The basis is comparatively massive, 2.5 times as long as the stylet itself, 0.34 mm in length, narrowed in front and slightly constricted near the truncated posterior end. Each of the two lateral pouches contains 2–3 accessory stylets which are similar in size and shape to the central stylet. The proboscis is provided with 12 nerves in the most part of its anterior chamber, but with 13–17 nerves near the insertion's point of the proboscis. Ocelli behind the brain are situated just above the lateral nerve cords. The cerebral sense organ is situated immediately in front and in the ventral portion of the brain. The canal of the organ, leading from posterior to the exterior, opens on the lateral surface of the head. The frontal organs are wanting. The diverticula of the intestinal



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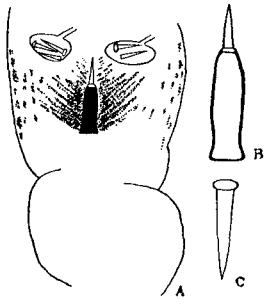

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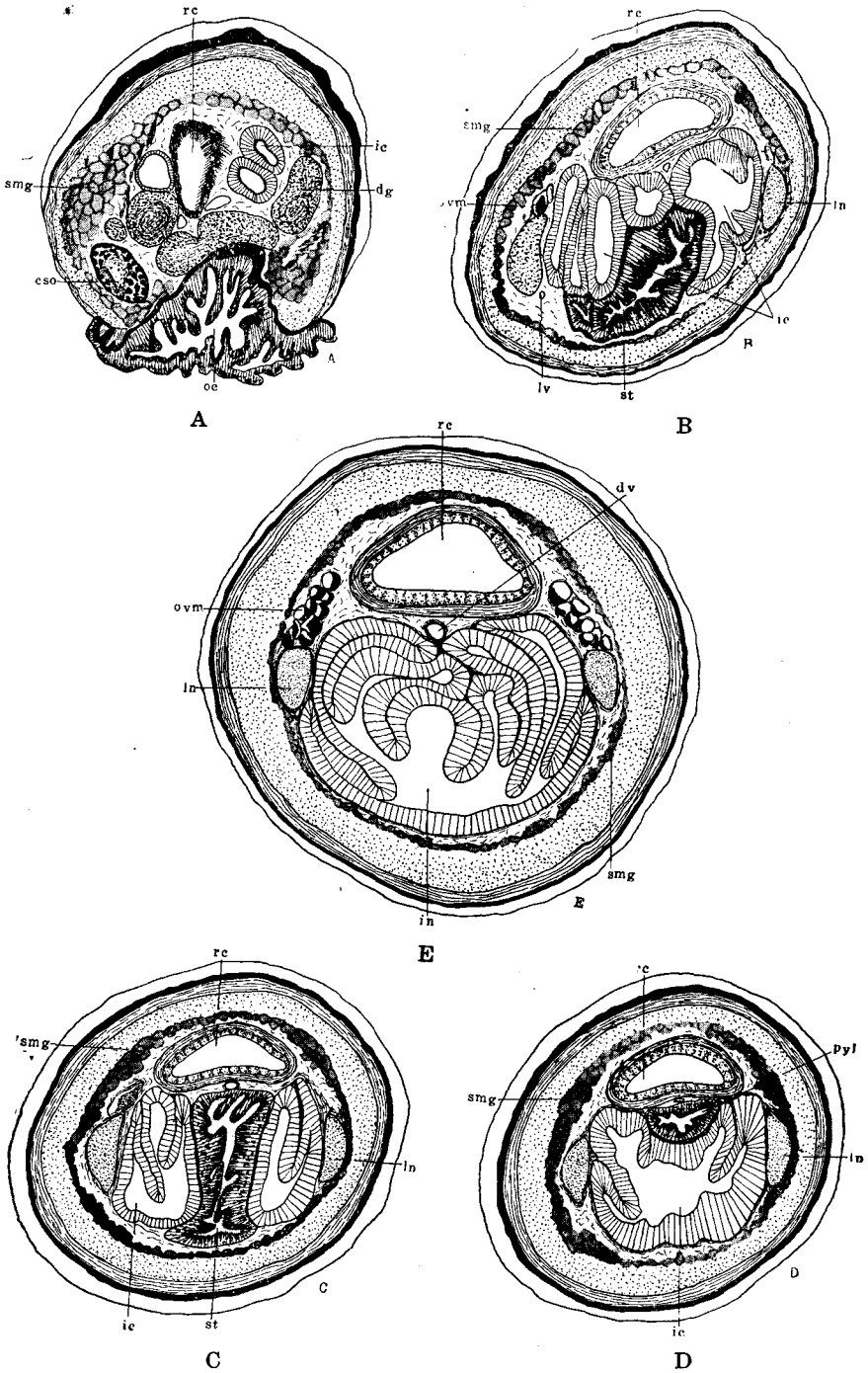
Fig. 22. *Zygonemertes glandulosa* sp. nov.; anterior portion of body dorsal view. ×10.

Fig. 23. *Zygonemertes glandulosa* sp. nov.; A. stylet apparatus of proboscis. B. central stylet. C. accessory stylet. Enlarged.



Fis. 24. *Zygonemertes glandulosa* sp. nov.; cross section through oesophageal region (A), anterior portion of stomach (B), posterior portion of stomach (C), posterior portion of pylorus (D), and anterior portion of intestine (E). ×60.

caecum extend as far as the anterior portion of the brain, being situated just above the latter, and behind the brain are located between the rhynchocoel and the oesophagus. Near the posterior ends of them, they are situated on both sides of the for-gut and at last are united into a large main intestinal caecum beneath the pylorus. The intestine is provided with numerous diverticula which are not separated from each other as seen in other groups, but massed in a group. Nephridia were not looked out in sections of the present material, because the specimen had been poorly fixed. The gonads are found in groups above the lateral nerve cords in the intestinal region. Each of the gonads contains only one immature ovum.

Remarks. Since the establishment of the genus *Zygonemertes* for *Amphiporis virescens* Verrill by Montgomery in 1897, 6 species of the genus were reported namely, *Z. verescens* (Verrill) Montgomery, *Z. thalassina* Coe, *Z. albida* Coe, *Z. africana* Stiasny-Wijnhoff, *Z. Lüderitzi* Stiasny-Wijnhoff, and *Z. capensis* Wheeler. The present species differs from any preexisting species in (1) in arrangement of ocelli, (2) the possession of the well developed sub-muscular glands and intestinal caecum and (3) the situation of the gonads.

Habitat. A single specimen was found under a stone near low water mark at Akkeshi in June, 1938. The other species of this genus, are found on the coasts of Alaska, Southwestern Africa and the northwest coasts of U.S.A.

Family 3 Prostmatidae BÜRGER, 1904
Genus *Prostoma* ANT. DUGÉS, 1828

Prostoma coronatum (QUATREFAGES, 1846)

(Pl. III, figs. 12, 13; Textfig. 25)

Tetrastemma coronatum: BÜRGER, 1895, Fau. u. Flo. Neapel, 22, S. 283–284, Taf. 3, Figs. 2, 8, Taf. 29, Figs. 40, 41.

Prostoma coronatum: BÜRGER, 1904, Tierreich, S. 61–62; G. WIJNHOFF, 1912, S. 430.

External characters. The body is moderately slender, 15 mm long and 0.5 mm wide, and flattened ventrally and conveyed dorsally. The head is bluntly pointed and broader than the part immediately following. The posterior end of the body is rapidly tapering. The

opening of the rhynchodaeum is situated at the tip of snout. Two pairs of lateral oblique grooves are found, of which the anterior pair is found at the broadest portion of the head and the posterior pair is situated far back from the anterior one. Each of the anterior grooves extends on dorsal surface from the lateral border obliquely backward toward the median line, fading out gradually before meeting with its fellow; on the ventral surface the grooves extend obliquely forward and fade out before falling on the median line. The posterior grooves are much more conspicuous, forming V-shape on the dorsal surface, and on the ventral surface extend obliquely forward and join on the median line. Two pairs of ocelli are found on the head, and the space between two ocelli of the anterior pair is broader than the space of the posterior ones which are situated just behind the anterior cephalic grooves. The body is tinged yellow sprinkled with green except the white head. There is an echelon-shaped brown band on the head. At the both anterior corners of pigment band are found the ocelli of the anterior pair. Numerous, small spots gleaming in silver are found both in front and behind the brown band, denoting the position of cephalic glands.

Internal structure. The epithelium is very thick and is filled up with numerous flask-shaped gland cells. The cephalic glands are fairly well developed and extend backwards nearly to the brain. The proboscis sheath extends to the posterior end of the body, and the proboscis is provided with 10 nerves. The central stylet of the proboscis is slender and acutely pointed, being 0.05 mm long. The basis is ball-shaped, 0.11 mm long, and two times as long as the stylet itself. Each of the two lateral pouches contains two or three slender accessory stylets. The diverticula of the intestinal caecum extend forwards to the dorsal commissure of the brain, and the lateral diverticula of the intestine are very deep and forked. The cerebral sense canals lead from the dorso-lateral points of the cephalic grooves to cerebral sense organs and end just in front of the brain. Ocelli are found deeply imbedded in the tissue of the head. Nephridia extend forward to the dorsal commissure of the brain and backward to the anterior portions of

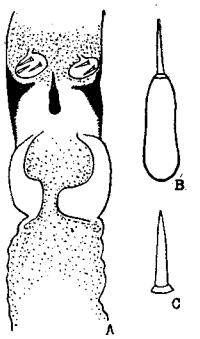


Fig. 25. *Prostoma coronatun*; stylet apparatus of proboscis (A), its central stylet (B) and its accessory stylet (C). Enlarged.

oesophagus, running just above the lateral nerve cords. Their efferent ducts have not been found out. The gonads were ripen in my specimen.

Remarks. The present species differs a little from the European species in the shape of the pigment band on the head.

Habitat. This material is found on stones near the low water mark at Akkeshi and Abashiri in June and July.

Geographical distribution. Akkeshi and Abashiri, Hokkaido, Japan; the north Atlantic Ocean and the Mediterranean Sea.

Prostoma nigrifrons (COE, 1904)

(Pl. III, fig. 14, Pl. IV, figs. 9, 10, 11, 12; Textfigs. 26, 27, 28, 29)

Tetrastemma nigrifrons: COE, 1904, pp. 159–164; ——, 1905, pp. 289–293, 1905.

External characters. The body is small and slender, 6 cm long and 0.5–1 mm wide, and flattened ventrally and somewhat convexed dorsally. The outline of the head is like an arrow-head in shape, broader than the rest of the body which is equally of the same width. The body is bluntly pointed in the posterior end. The rhynchodeal opening is situated at the tip of snout. Cephalic grooves are found in two pairs on the head; the anterior pair is situated just behind the broadest portion of the head, while the posterior one encircles the neck. Each of the anterior grooves extends a short distance towards the median line on the dorsal surface, while on the ventral surface the groove runs forward along the lateral margin of the head and meets with its fellow on the median line, where also confluents the posterior depression of the rhynchodeal opening, the posterior cephalic groove bends backwards on the dorsal surface, but on the ventral surface it runs nearly in a straight line. Two pairs of ocelli are found on the head, of which the anterior pair is situated near the tip of snout and the posterior pair is found just in front of the posterior cephalic groove. The space between two ocelli of the anterior pair is broader than that between the posterior ones. The head

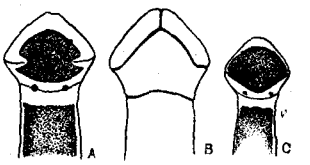
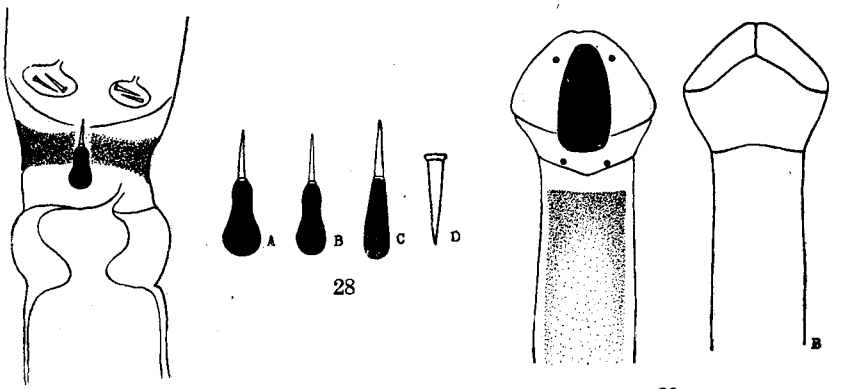


Fig. 26. *Prostoma nigrifrons*; anterior portion of body; A, dorsal view. ×6.5. B, ventral view. ×6.5. C, dorsal view. Enlarged.

is white and has a large brown pattern, on the dorsal surface. It is convex on its anterior and posterior margins and concave on both side opposite to the anterior cephalic grooves. The cephalic marking is often rounded triangular in shape. The ocelli of anterior pair are found just in front of the antero-lateral margins of the caphalic marking. The trunk is deep brown on the dorsal surface and yellowish rose on the ventral surface. There is a large transverse white ring on the neck. Often the colour of the body is faded away into yellow tinged with brown on the dorsal surface of the trunk, even when the cephalic marking is deep brown and the large white band is found clearly on the neck.

Internal structure. The epithelial glands are not so numerous. The cephalic glands are found above the rhynchodaeum, extending near the anterior end of the brain. The parenchymatous tissue without any muscle fibres is voluminously developed inside the body wall. The proboscis sheath extends nearly to the posterior end of



27 28 29

Fig. 27. *Prostoma nigrifrons*; stylet apparatus of proboscis. Enlarged.

Fig. 28. *Prostoma nigrifrons*; central stylet (A, B, C) and accessory stylet (D). Enlarged.

Fig. 29. *Prostoma nigrifrons*; anterior portion of body; A, dorsal view. ×65. B, ventral view. ×32.

the body and the proboscis nerve is 11 in number. The basis of the central stylet is pear-shaped, and the central stylet is pointed sharply and is a little more than half as long as basis. There are 2–4 (commonly 3) accessory stylets in each of the two lateral pouches. The basis varies in length from 0.08–0.23 mm and stylet from 0.06–0.14 mm. Ocelli lie deeply imbedded in the tissue of the head. The

cerebral sense organ is very small in comparison with the brain, situated at some distance in front of the brain, with the anterior end leading to the cerebral canal which opens externally on the lateral surface of the snout. The diverticula of the intestinal caeca extend near the posterior end of the brain, and the lateral diverticula of the intestine are simple and not forked. The nephridial canals extend from the posterior end of the brain to the posterior end of the pylorus, and open externally on each side at the anterior portion of nephridia by an efferent duct. The gonads alternate with the intestinal diverticula in position and were ripen in the specimens.

Remarks. This species is characterized by the following features; (1) the body is a little small in size, 3–5 cm long and 0.3–0.4 mm wide, (2) the head marking is a deep brown wedge-shaped pattern, being bluntly pointed anteriorly and rounded posteriorly and (3) the proboscis sheath extends only to the half of the body length. The pattern on the head is situated within the square area formed by four ocelli and extends a little forward beyond the anterior ocelli. The trunk is white and is provided with the cluster of small brown spots only near the neck on the dorsal surface. These brown spots often extend posteriorly to 1/2 the length of body in two longitudinal lines.

Habitat. The present form was found under stones near the low water mark at Akkeshi and Abashiri in May, June and July. The worm also lives in the canal system of a sponge which is attached to gastropod shells living on the bottom of several meters deep in Akkeshi Bay.

Geographical distribution. Hokkaido, Japan; California.

Prostoma stigmatum (STIMPSON, 1857)

(Pl. VI, fig. 13; Textfigs. 30, 31)

Tetrastemma stigmatum: STIMPSON, 1857, p. 19; BÜRGER, 1904, S. 65.

External characters. The body is small and slender, 7–10 cm long and 1 mm wide, and somewhat flattened dorso-ventrally. The head is broadened, somewhat emarginate in front and a little broader than the rest of the body. The body is almost of the same width and ends bluntly at its posterior extremity. Cephalic grooves are in two pairs found on the head, of which the anterior one is situated near

the broadest portion of the head while the posterior one at the posterior end of the head. Each of the anterior grooves on both sides passes obliquely backward and soon fades out on the dorsal surface of the head, but on the ventral surface it leads forward along the lateral margin of the head to meet with its fellow on the median line near the tip of snout where also confluents the posterior depression of the rhynchodeal opening. The posterior cephalic groove encircles the neck, bending backward forming a V on the dorsal surface but traversing straight on the ventral surface. Two pairs of ocelli are situated on the head, of which the anterior pair is found near the tip of snout and the posterior pair just anteriorly to the posterior cephalic groove. The interval between two ocelli of the anterior pair is broader than that of the posterior pair, and the distance between the anterior and posterior pair is wider than the distance of eyes in both pairs. The ocellus is often double. The body is yellow without any markings, or rarely yellow tinged with green, red blood vessels being always found clearly through the skin, extending throughout the length of the body. When ripen the female is greenish white corresponding to colours of genital products.

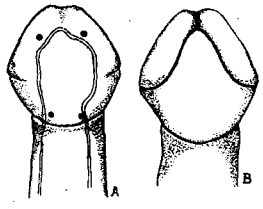


Fig. 30. *Prostoma stigmatum*; anterior portion of body; A, dorsal view. ×10. B, ventral view. ×10.

Internal structure. The epithelial glands are well developed. The cephalic glands extend a short distance in front of the brain. The proboscis is provided with distinct 11 nerves. The basis of the central stylet is pear-shaped, though rarely oval in shape, and a little longer than 1.5 times the length of the stylet; the basis is 0.14–0.17 mm long and the stylet about 0.08 mm long. Each of the two lateral pouches is provided with 2–5 (commonly 2–3) accessory stylets. The diverticula of the intestinal caeca extending forward in a pair a

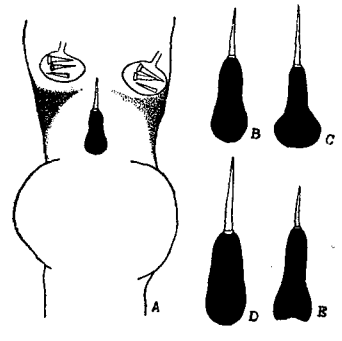


Fig. 31. *Prostoma stigmatum*; stylet apparatus of proboscis (A) and central stylets (B, C, D, E). Enlarged.

little distance to the posterior end of the brain, are not forked but represented by simple lateral pouches and generally situated alternately in position with the gonads which are ripen in May, June and July. The cerebral sense organs are small and lie at some distance in front of the brain, with the cerebral canals which lead forward from the anterior ends of the sense organs and open externally on both sides near the tip of snout. Nephridia extend from near the posterior end of the brain to the posterior end of the pylorus and open externally on the latero-ventral surfaces of the body at the anterior portion of nephridia.

Remarks. The present species differs from Stimpson's material collected at Hakodate in size and colour, and in the relative size of anterior and posterior pairs of ocelli.

Habits and habitat. This worm is numerously found under stones or among seaweed on beaches at Akkeshi and Abashiri in May, June, and July. They are sluggish in movement, and artificial insemination is very easily performed.

Order 2 BDELLOMORPHA
Genus *Malacobdella* BLAINVILLE, 1827

Malacobdella japonica TAKAKURA, 1897

(Pl. IV, figs. 14, 15, 16; Textfigs. 32, 33)

Malacobdella japonica: TAKAKURA, 1897, Annot. Zool. Japan., I, pp. 105–112; ——, 1897, Zool. Mag., 9 1897.

External characters. The body is about 34–37 mm long and 10 mm wide in normal condition in life, flattened ventrally and a little convexed dorsally, consisting of a head, a trunk and a sucker and showing leech-like movement in life. The head is oval in outline, narrower than the trunk, and is marked off from the latter by becoming narrow at its posterior portion. The trunk is about four times longer than the head, widest near the posterior two thirds of the trunk, becoming narrow posteriorly, and is provided with a large disc-like sucker on the ventral surface. The mouth enormously large, opens at the anterior end of the head, both the dorsal and the ventral lips being provided with V-shaped excavations in the middle. The anus is found on the mid-dorsal surface of the posterior end of the trunk. The body is semitransparent opal in colour; therefore, the

yellow brain, lateral nerves, proboscis, meandering intestine and the gonads are observed through the integument. When matured, the gonads of the male are white, and those of the female are rose in colour, filling up the space on both sides of the intestine. Takakura (1897) has measured the Japanese species collected at Shimousa as being 45 mm long and 4 mm wide in the extended condition. The European species, *M. grossa,* collected by Riepen at Kiel is somewhat smaller than the Japanese species, being 20–22 mm long and 8–10 mm wide, but larger forms measuring 30–40 mm long were also found at other places by him and others.

Internal structure. The rhynchocoel, as observed by Takakura, extends in the anterior two thirds of the body, and never reach the posterior end of the body as in *M. grossa.* The retractor muscle passes through the wall of the rhynchocoel at its posterior extremity, runs parallel to the dorsal surface of the body within the parenchyma and at last ends freely or in some individuals, bifurcated dorso-ventrally. The dorsal branch thus bifurcated is affixed to the dorso-ventral muscle fibres which are crossed with the longitudinal muscle fibres of the body wall, while the ventral branch ends freely in the parenchyma. Of the termination of the retractor muscle fibres in Japanese species, Takakura noticed that they bend ventrally and terminate freely in the parenchyma without connection with the muscular body wall, except their crossing with the dorso-ventral fibres. In the European species, *M. grossa,* however, some of their fibres end freely in the parenchyma, while others bend dorsally, crossing with the longitudinal muscle fibres of the body. The intestine making more than ten windings is deficient in diverticula, as observed by Takakura, while that of *M. grossa* shows only 5–6 windings. The circulatory system in the adult shows very complex anastomoses among the dorsal vessels and the lateral vessels respectively, showing a great deal of individual variations as observed by Takakura. The blood vessels in the anal region of the present species are very simple, without branches or anastomoses as observed by Takakura, while those of *M. grossa* are very complex, provided with many branches. Of the circulatory system of *M. grossa,* Riepen observed that there is no trace of connections between the blood vessels, except three commissures, the cephalic, oesophageal and anal ones. Other authors, however, noticed the anastomosis of the blood vessels. The lateral nerve cords are communicated with each other by a strong

acetabular commissure running far behind the anus along the posterior margin of the sucker, and run posteriorly as a small nerve, one on each side ending freely. There is neither traces of the anal commissure above the anus, other commissures below the rectum, nor internal branches of the lateral nerve cords, as is found in *M. grossa*. At points where the lateral nerve cords enter the sucker, the lateral nerve cords give off a small branch, one on each side of the sucker ventrally to the rectum, communicating with the corresponding nerve on the other side or ends freely giving off the small branches. Takakura, however, stated that these nerves communicate along the anterior margin of acetabulum. The lateral nerve cords give off small branches towards the lateral margins of the sucker, one on each side at a little anterior portion of the acetabular commissure. Riepen described that the small nerves running behind the anal commissure along the posterior margin of the sucker in *M. grossa* are homologous to the acetabular commissure of *M. japonica*, but these two nerves are not of the same nature, because the latter commissure is very large, distinct and gives off small branches on both sides which may probably correspond to the former, as mentioned above. The nephridia are represented by two large longitudinal canals, one on each side, extending from near the brain to the anterior intestinal region covering 1/4 the length of the body. They are branched only in their anterior portion and have efferent nephridial ducts in a pair at the posterior end. The external opening of the efferent nephridial duct is situated dorso-laterally to the lateral nerve cord and opens on the dorso-lateral surface of the body, as observed by Takakura, while that of the European species opens on the latero-ventral surface of the body and is situated latero-ventrally to the lateral nerve cord. The gonads are ripen in May and June.

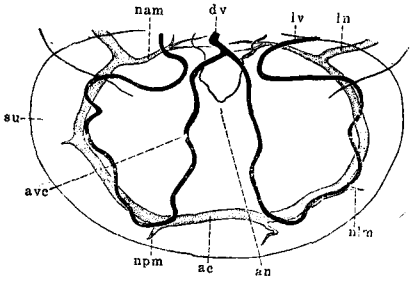


Fig. 32. *Malacobdella japonica*; nervous and circulatory systems in anal region, reconstructed from serial sections. ×10.

Remarks. In 1897, Takakura separated the Japanese species of *Malacobdella* from the European species, *M. grossa*, by the short rhynchocoel, the presence of the acetabular commissure instead of an

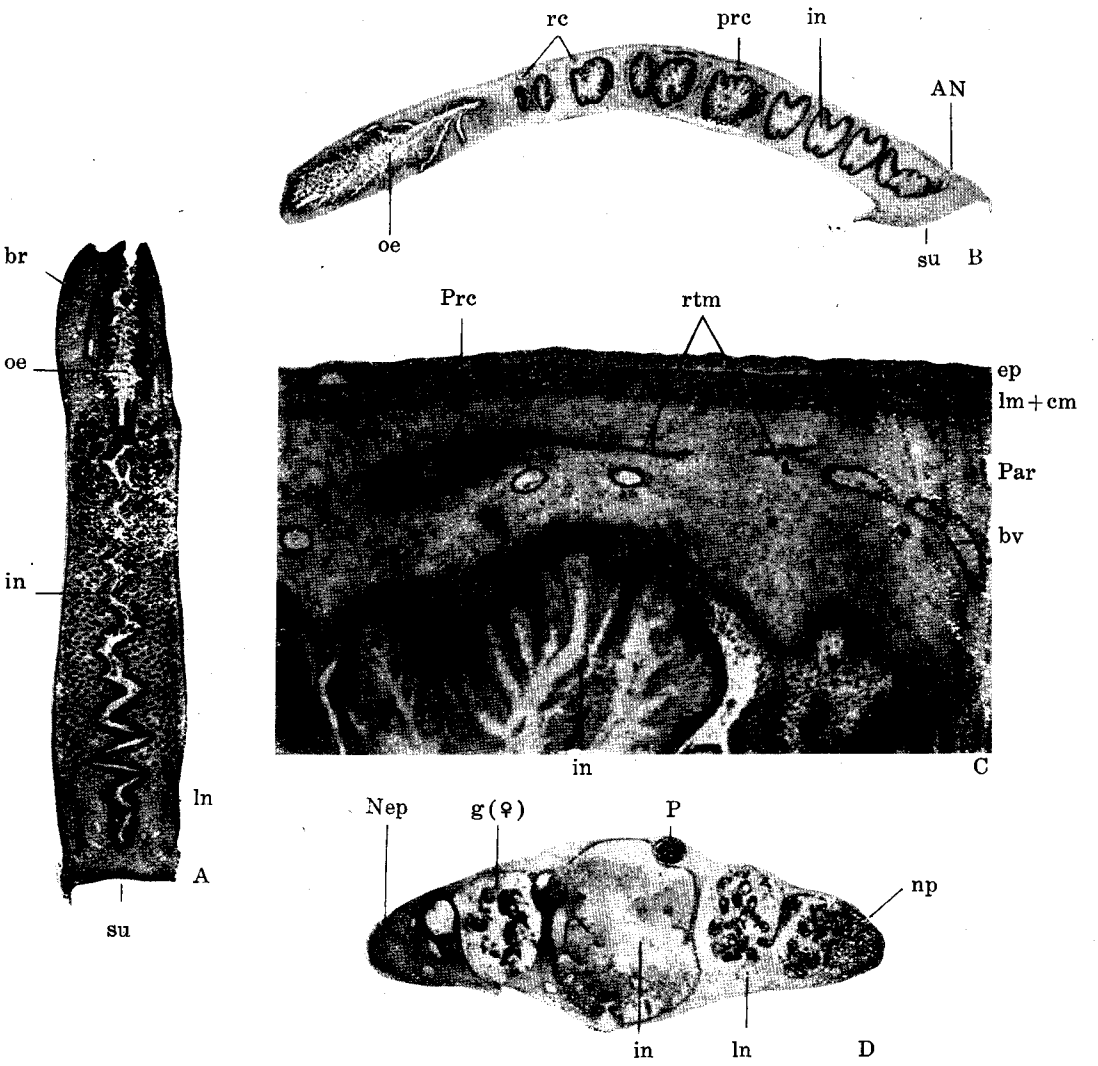


Fig. 33. *Malacobdella japonica*; A. horizontal section through longitudinal axis. ×5.5. B. sagittal section through median line. ×5. C. posterior end of retractor muscle in sagittal section. ×100. D. cross section through intestinal region. ×20.

anal, and the complicated anastomosis of the blood vessels. Riepen (1933) who studied *M. grossa* in detail, reached to the conclusion that Japanese species would be a geographical variety of *M. grossa* from the following view-points; (1) the circulatory system of *M.*

grossa shows a great deal of individual variations according to the habitat, hosts, and stages of growth, and the similarity of anastomosis of the blood vessels in two species was pointed out by several other authors, and (2) the nerves which run along the posterior margin of the sucker of *M. grossa* seems to correspond to the acetabular commissure of the Japanese species. The present author's observation accords with Takakura as mentioned above, and the Japanese species can be distinguished from the European species, in the following points; (1) the rhynchocoel extends in the anterior two thirds of the body, and in the anal region there is only a strong acetabular commissure, instead of the anal and other commissures of *M. grossa*, and the nerves which had been admitted in *M. grossa* as corresponding to the acetabular commissures of *M. japonica* are also found in the Japanese species, (2) the intestine shows more than 10 windings, and (3) the external openings of the nephridia are situated at the dorso-lateral aspects of the body. The circulatory system, which was considered by Takakura as being valuable, seems to be of no importance for the specific discrimination as stated by Riepen.

Habits and habitat. The present species lives in the mantle cavity of *Spisula sachalinensis*, which is found in abundance at Akkeshi; attaching by the sucker to the mantle, gill, foot, adductor muscle or to the labial palps. Of 27 shells, about 10 cm long and 8 cm high, which I examined in May and June in 1938, 24 were found to be infected with a single worm respectively. The worms were all adult forms, being 16 males and 8 females. Of 60 shells, which has been collected at the same place in summer, 1936 by S. Kawai, 52 were found to be infected, of which only one shell contained an adult female and a young individual, while the other shells contained respectively a single adult worm, including 23 males and 28 females. As mentioned above, about 87% of *Spisula sachalinensis* at Akkeshi are found to be infected with the present nemertean. In 1897, Takakura reported ca 96% parasites of this nemertean in *Spisula sachalinensis* at Shimousa. Riepen also reported that about 50–60% of *Cyprina islandica* infected with *M. grossa* in the Bay of Kiel, Germany. The mode of movement of the present species is similar to that of the leech as observed by E. Friedrich. They remove from here to there, adhering to the substrata by the ventral surface of the head and the posterior sucker alternately, or fix to the same

place by the sucker remaining the anterior end free.

Geographical distribution. Shimousa, central Japan (by Takakura), Akkeshi; northern Japan. It may be sure that the present form distributes throughout the coasts of northern Japan where *Spisula sachalinensis* is found. The European species, *M. grossa,* is found along the coasts of middle Europe, in the Mediterranean Sea and on the east coast of U.S.A. Coe reported that *Malacobdella* sp. was found in California, and Guberlet (1925) described *M. grossa* from the Pacific coast of North America.

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Explanation of Plates and Textfigures

Abbreviations

ac, acetabular nervous commissure. an, anus. avc, anal commissure of blood vessel. bl, blood lacuna. bm, basement membrane. br, brain. bv, blood vessel. cc, cerebral canal. cf, horizontal cephalic furrow. cg, cephalic gland. cm, circular muscle layer. cso, cerebral sense organ. cu, cutis. dg, dorsal ganglion. dn, dorsal nerve. dv, dorsal blood vessel. eg, eosinophilic gland cell. ep, epithelium. fo, frontal organ. g, gonad. gp, genital pore. ic, intestinal caecum. icm, inner circular muscle layer. in, intestine. lm, longitudinal muscle layer. imp, longitudinal muscle plate. ln, lateral nerve cord. lr, lateral blood vessel. mc. muscle cross. nam, anterior branch of acetabular commissure. nd, efferent nephridial duct. nep, nephridial canal (nephridia). nlm, lateral branch of acetabular commissure. np, external opening of efferent nephridial duct. npm, posterior branch of acetabular commissure. nx, nerve plexus. oe, oesophagus. olm, outer longitudinal muscle layer. ov, oesophageal blood vessel. ovm, ovum. p, proboscis. par, parenchyma. pn, proboscis nerve. prc, posterior end of reynchocoel. pyl, pylorus. rc, rhynchocoel. rh, rhynchodaeum. rtm, retractor muscle. smg, submuscular gland. so, side organ. st, stomach. su, sucker. to, terminal organ (nephrostome). vg, ventral ganglion.

Explanation of Plates

PLATE XIV

1, 2. *Tubulanus punctatus* (Takakura). 1, entire animal ×1.2; 2, anterior portion, dorsal view. ×1.2.

3, 4. *Tubulanus ezoensis* sp. nov. 3, entire animal. ×1.2; 4, anterior portion, dorsal view. ×4.2.

5, 6, 7, 8. *Cephalothrix linearis* (Rathke). 5, 6, entire animal. ×0.9; 7, 8, dorsal views of intestinal region in female (7) and male (8). ×6.

9, 10, 11, 12, 13, 14. *Lineus torquatus* Coe. 9, entire animal. ×0.6; 10, anterior portion of chestnut coloured variety. ×7.2; 11, anterior portion, dorsal view. ×2.4; 12, anterior portion, dorso-lateral view. ×2.4; 13, anterior portion, ventral view. ×2.4; 14, posterior end of body, dorsal view. ×2.4.

PLATE XV

1, 2, 3, 4, 5. *Lineus alborostratus* Takakura. 1, entire animal. ×0.6; 2, anterior portion, dorsal view. ×3; 3, anterior portion, ventral view. ×3.6; 4, entire animal. ×0.6; 5, anterior portion, dorsal view. ×2.4.

6, 7, 8. *Cerebratulus marginatus* Renier. 6, entire animal, dorsal view. ×0.6; 7, anterior portion, side view. ×0.6; 8, anterior portion, ventral view. ×0.9.

9, 10. *Micrura alaskensis* Coe. 9, entire animal. ×0.6; 10, anterior portion, ventral view. ×7.3.

11, 12. *Micrura akkeshiensis* sp. nov. ×0.9.

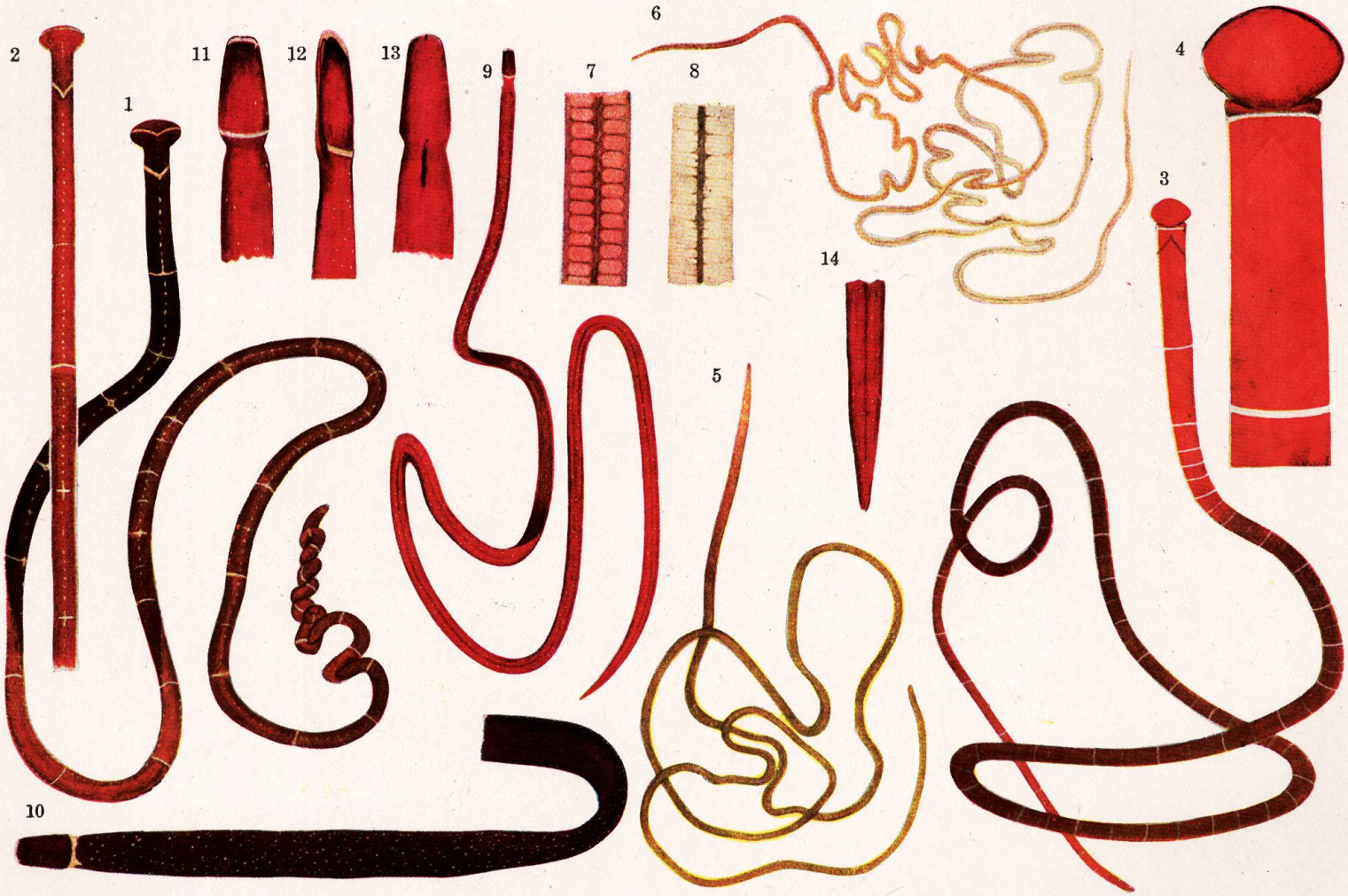
13, 14, 15. *Micrura bella* (Stimpson). 13, entire animal, dorsal view. ×5; 14, entire animal, ventral view. ×5; 15, anterior portion, side view. Enlarged.

PLATE XVI

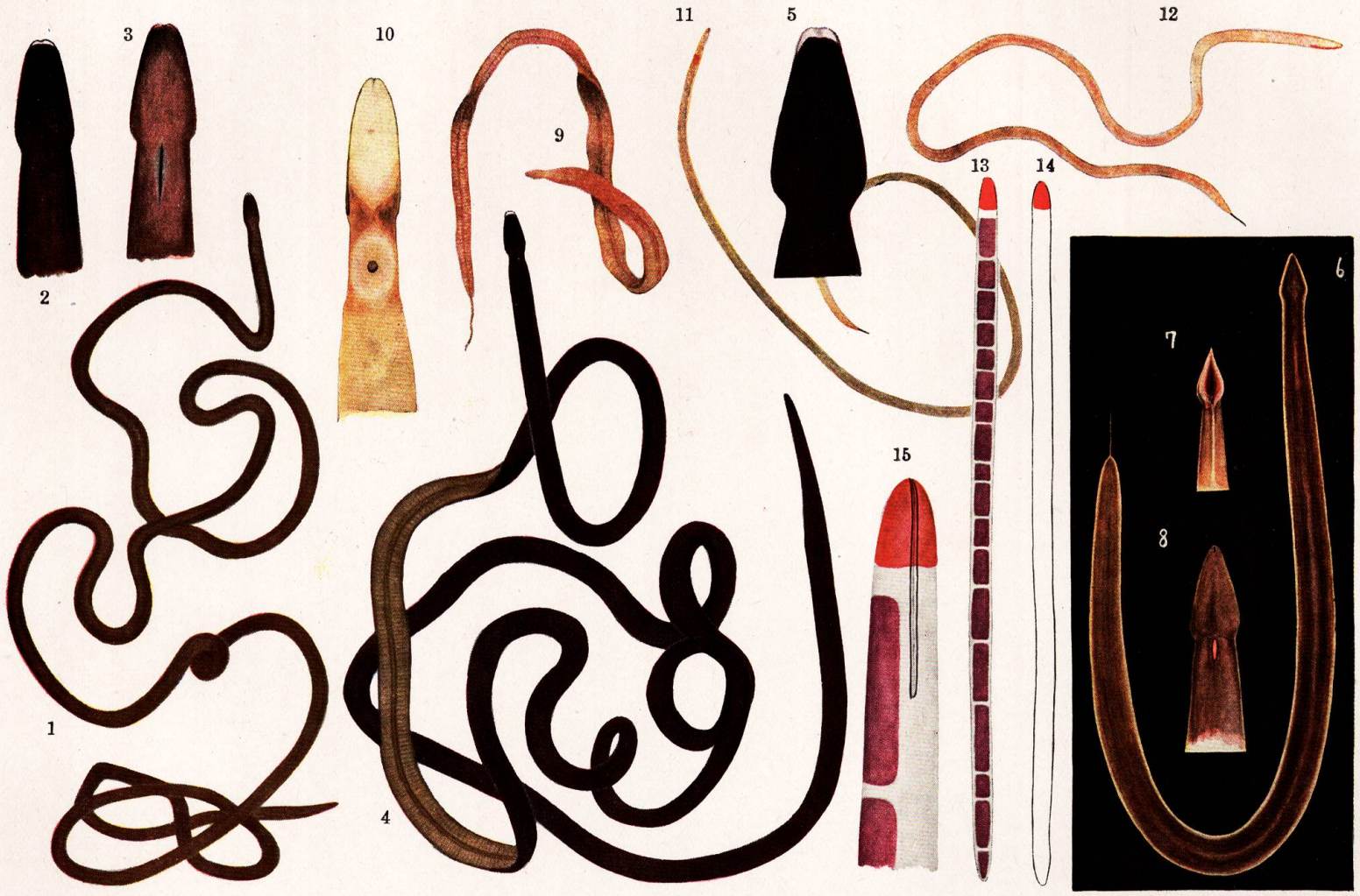
1. *Micrura akkeshiensis* sp. nov. ×0.9.
2, 3, 4. *Micrura magna* sp. nov. 2, entire animal. ×0.6; 3, anterior portion, dorsal view. ×3.6; 4, anterior portion, ventral view. ×3.6.
5, 6, 7. *Micrura uchidai* sp. nov. 5, entire animal. ×1.8; 6, anterior portion, dorsal view. ×4.2; 7, anterior portion, ventral view. ×5.0.
8, 9, 10, 11. *Baseodiscus curtus* (Hubrecht). 8, entire animal, dorsal view. ×0.7; 9, anterior portion, dorsal view. ×2.4; 10, anterior portion, ventral view. ×2.4; 11, anterior portion, ventral view. ×1.8.
12, 13. *Prostoma coronatum* (Quatrefages). 12, entire animal, dorsal view. ×6; 13, anterior portion, dorsal view. ×12.
14. *Prostoma nigrifrons* (Coe). Anterior portion, dorsal view. ×5.

PLATE XVII

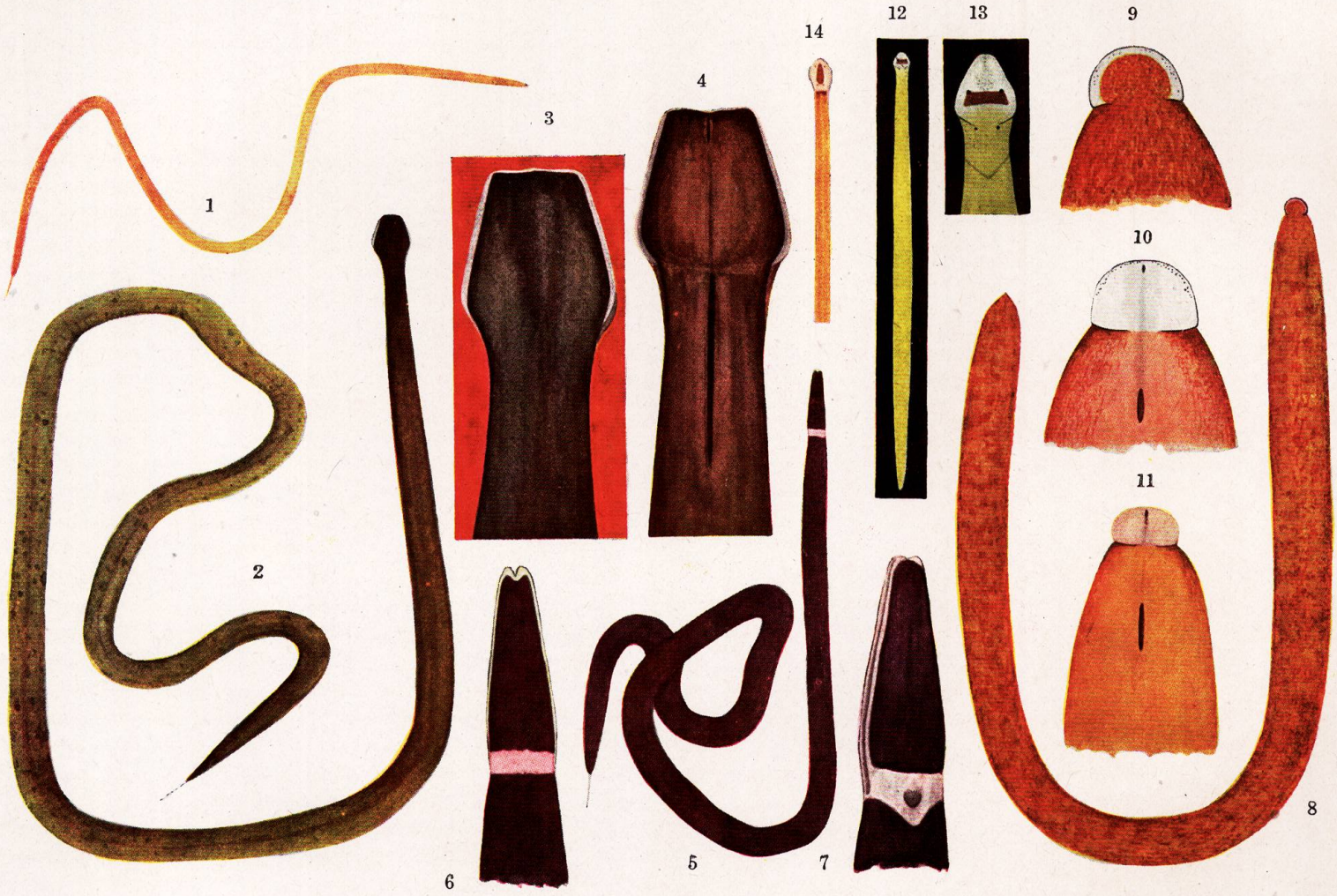
1, 2. *Emplectonema gracile* (Johnston). 1, entire animal. ×0.7; 2, anterior portion, dorsal view. ×18.
3, 4, 5. 6. *Paranemertes peregrina* Coe. 3, entire animal. ×1.2; 4, anterior portion, dorsal view. ×3; 5, anterior portion, ventral view. Enlarged; 6, entire animal. ×1.8.
7. *Amphiporus parvus* sp. nov. ×3.
8. *Zygonemertes glandulosa* sp. nov. Enlarged.
9, 10, 11, 12. *Prostoma nigrifrons* (Coe). 9, ×2.4; 10, ×5; 11, ×6; 12, anterior portion, dorsal view. ×12.
13. *Prostoma stigmatus* (Stimpson). Slightly diminished in size.
14, 15, 16. *Malacobdella japonica* Takakura. 14, female, dorsal view. ×2.4; 15, male, dorsal view. ×2.4; 16, Male, ventral view. ×1.8.



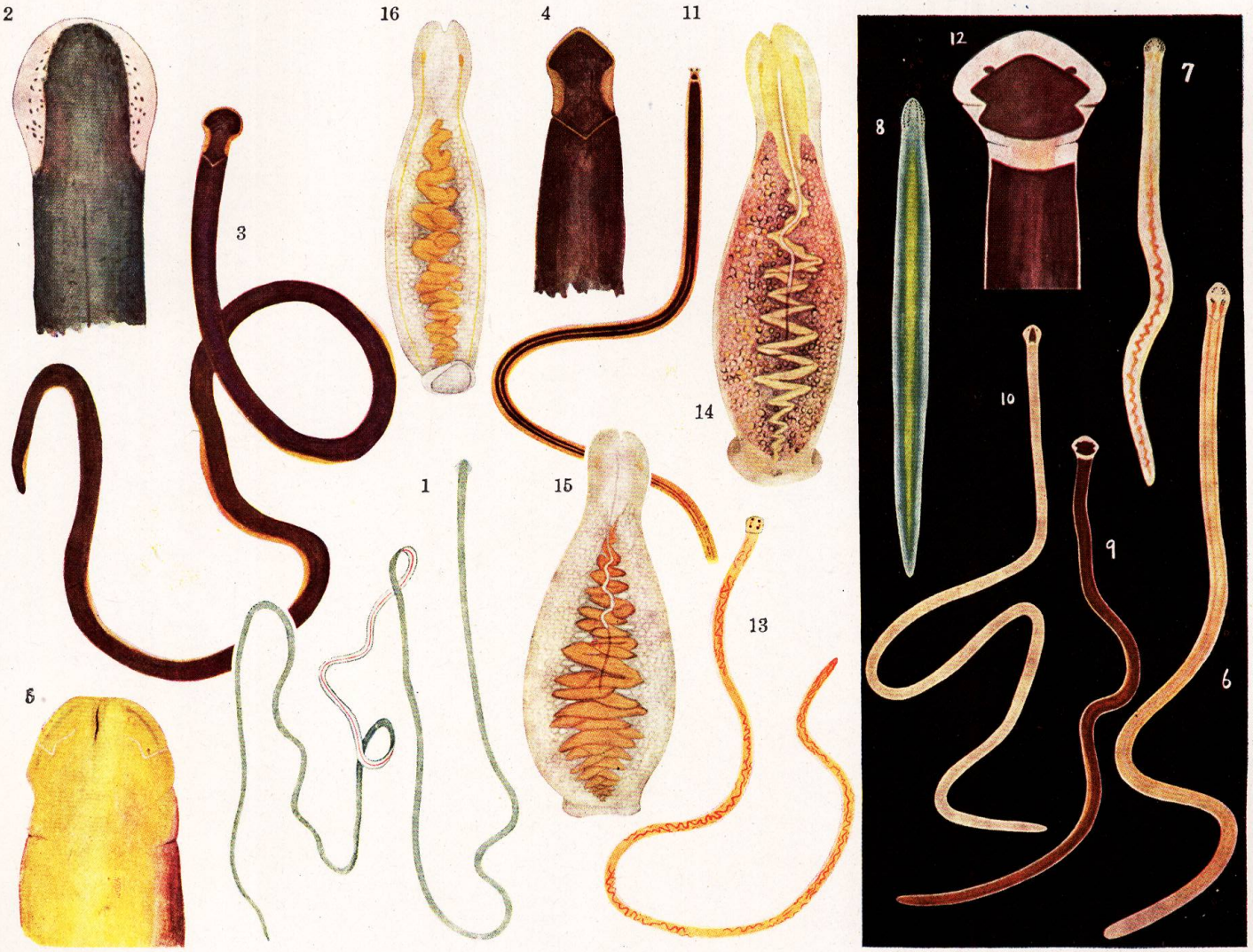
T. Yamaoka: Nemertini of Akkeshi Bay



T. Yamaoka: Nemertini of Akkeshi Bay



T. Yamaoka: Nemertini of Akkeshi Bay



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